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Department of
Mineralogy & Petrography
HARVARD UNIVERSITY
Cambridge, MASS.

EIGHTEENTH ANNUAL REPORT

OF THE

UNITED STATES GEOLOGICAL SURVEY

TO THE

SECRETARY OF THE INTERIOR

1896-97

CHARLES D. WALCOTT
DIRECTOR

IN FIVE PARTS

PART I.—DIRECTOR'S REPORT, INCLUDING TRIANGULATION AND SPIRIT LEVELING.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1897

EIGHTEENTH ANNUAL REPORT

OF THE

UNITED STATES GEOLOGICAL SURVEY.

PART I.—DIRECTOR'S REPORT, INCLUDING TRIANGULATION AND SPIRIT LEVELING.

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LETTER OF TRANSMITTAL.

Department of the Interior,
United States Geological Survey,
Washington, D. C., July 27, 1897.

SIR: I have the honor to transmit herewith a report of the operations of the United States Geological Survey for the year ending June 30, 1897.

In this connection permit me to thank you for the interest you have manifested in the work of the Survey.

I am, with respect, your obedient servant,

Chas. D. Walcott,
Director.

Hon. Cornelius N. Bliss,
Secretary of the Interior.

EIGHTEENTH ANNUAL REPORT OF THE UNITED STATES GEOLOGICAL SURVEY.

CHARLES D. WALCOTT, DIRECTOR.

INTRODUCTION.

During the fiscal year 1896-97 the organization of the Geological Survey as set forth in the Director's last report was continued without material change, and the field work of 1896 was largely a continuation of that of the previous season.

The most important change in the field work was rendered necessary by the legislation providing for the establishment of levels and permanent monuments and bench marks. The clauses of the act embodying this legislation, and a full statement of the reasons for it, were given in the Introduction to Part I of the Seventeenth Annual Report, pages 7 to 11, and the subject is again referred to further on in this report. The actual cost of the leveling and monuments for the year was somewhat greater than it will be another year, as the expense of training men and initiating the new methods of survey will not have to be met hereafter. During the year 10,840 miles of levels were run and 1,820 bench marks were established.

The topographic surveys to date cover an aggregate area of 759,525 square miles, of which about 240,000 square miles are on a scale of 4 miles to the inch. The latter portion represents the earlier work of the Survey, which is not now available for the preparation of geologic maps, as it is not possible with present standards properly to represent the geology on so small a scale. These maps, however, are far superior to all other existing maps of three-fourths of the area of the country, and have served a useful purpose in the development of the regions they represent. Of those on the 2-mile scale, probably 20 per cent will have to be more or less revised before they can be used as bases for geologic folios, and in some cases the areas shown on these also must be entirely resurveyed. All of the 1-mile-scale maps are of a higher grade of accuracy, and are adequate for all purposes except special mining maps. During the last three years 23,500 square miles of old work, mainly in the coal and iron areas of the Appalachians and in the Arkansas Valley in Kansas and Colorado, have been revised and brought up to date.

The topographic work has progressed very satisfactorily under the present organization of that branch of the Survey. While the output in square miles is not so large as for some previous years, the proportion in relation to the appropriation is greater, and the quality of the maps is considerably better, owing to the introduction of more accurate vertical control and to the requirement of greater care in sketching the topography.

The subdivisional and topographic surveys of the Indian Territory also advanced very satisfactorily until they were suddenly checked by the failure of the Indian bill on March 4, 1897. The parties were kept in the field in the hope that the appropriation would be promptly made, as this would avoid the loss incident to breaking up the parties and transferring the camp equipage to towns for storage. When it became apparent that the bill would fail, and that the remaining portion of the appropriation would keep the work going only a few days, all parties in the field were promptly called in. Several of them did not receive the orders for some time, owing to their great distance from telegraph and mail facilities. The various parties, in some instances after traveling 100 to 140 miles over rough mountainous roads, gathered at the two rendezvous stations, Wagoner and South McAlester, where the stock was placed in pasture and the equipments were stored. When the work was resumed, after the bill became a law, in June, the parties returned to the ground where the work had been abandoned in March. Had the appropriation been available on March 4, as anticipated, the field survey of the Territory, with the exception of the lands of the Chickasaw Nation, would have been completed within the estimated time and appropriation. As it is, the completion of the work will be delayed between four and five months, and there will be an additional expense, estimated at $25,000, arising from interruption of the work, care of stock, etc., during the suspension of the survey, and reorganization of parties. It is now believed that the office work will be completed and the land plats turned in to the General Land Office by July 1, 1898.

Under the special provision made for the resurvey of the lands of the Chickasaw Nation, work was begun the latter part of June, and it is expected that the entire area will be surveyed within the fiscal year just begun.

In the sundry civil bill approved June 4, 1897, provision is made for the survey of the northern portion of the boundary line between Idaho and Montana. This is the first work of the kind assigned to the Geological Survey, and it will be done in such manner as to insure the required accuracy for the boundary line and provide data for future topographic maps in the vicinity of the boundary. This will be accomplished by having the control of the position of the boundary established by triangulation. It is also provided that the triangulation shall be extended southward along the line of the Bitter Root Mountains. The plan for this survey was approved by the Secretary of the Interior and the work was begun the last of June.

Provision was also made for the survey of the forest reserves, an appropriation of $150,000 being made for the purpose. The plan of operations for this work was submitted to the Secretary early in June, and before the close of the month surveying parties left Washington to begin the work in the Black Hills reserve of South Dakota, the Teton and Big Horn reserves of Wyoming, the Bitter Root, Flathead, and Priest River reserves of Montana, and the Washington reserve of Washington. Plans were also formulated and approved for an examination of the distribution of the forests in the same reserves. It is anticipated that before the close of the field season sufficient data will have been secured in relation to the settled areas of the reserves embraced in the Executive orders and proclamations which were by Congressional action suspended until March 1, 1898, to enable the Department to form an opinion, based upon maps and notes, as to the population and improvements that are included within the areas of the reserves; also as to the distribution of the forested and agricultural lands.

During the year the work on the Educational Series of Rocks was completed, and preparations were made for the distribution of the specimens. The series includes 190 sets containing 150 specimens each, and about 60 sets containing a smaller number of specimens. These collections will be distributed to the principal educational institutions of the country where geology is taught.

Several committees were appointed during the year for the purpose of assisting the Director by making investigations and recommendations concerning special matters referred to them, viz: 1, Petrographic work; 2, Petrographic laboratory; 3, Petrographic nomenclature; 4, Chemical analyses.

1. To facilitate the petrographic work of the Survey, a committee, consisting of Messrs. Cross, Clarke, Diller, Lindgren, and Willis, was appointed, to which all matters pertaining to petrography might be referred. The petrographic microscopes and the special apparatus used with them have been placed in the custody of this committee, and it has also been charged with the preparation of a collection of thoroughly typical rocks for use by all the petrographers of the Survey. A descriptive card catalogue, with cross references, has been devised, and about 400 rocks have now been catalogued in this way. Arrangements have been made for adding much valuable material to this collection during the coming year. The committee is also charged with the preparation of a reference collection of ore minerals. The microscopic study of ores, vein material, and wall rock of veins has yielded interesting and valuable results, and it is believed that the collection will be of much service.

2. All material of which thin rock sections are requested by geologists of the Survey is referred to a committee, consisting of Messrs. Diller, Turner, and Willis. This committee makes recommendations in relation to the desirability of having the sections cut and the order of precedence in which the material shall be taken up for sectioning.

3. Owing to the prevailing confusion in the nomenclature of rocks, a committee, consisting of Messrs. Van Hise, Iddings, Cross, Diller, Turner, and Weed, was appointed to give attention to the classification of igneous rocks in a broad manner for use by the Survey. As the same subject is to be considered by the International Geological Congress which meets in St. Petersburg in August, the final report of the committee has been deferred until after that meeting, as one of its members, Professor Iddings, is to take part in the discussion at the congress.

4. The committee on chemical analyses consists of Messrs. Lindgren, Clarke, Hayes, Weed, and Willis. To it are referred all requests for analyses, and the committee recommends to the Director those which, in its opinion, should be made, and their order of precedence.

The growth of the work of the Survey has been such that it was found necessary to appoint an assistant to the Director in geology, to superintend the details of the Geologic Branch, and Mr. Bailey Willis, who as editor of geologic maps had acquired a thorough knowledge of the work of the geologists, was selected for the position.

It will be necessary within a short time to increase the accommodations for the office force of the Survey. This can be done in the present quarters by securing two additional floors in the annex building, to which some of the laboratories of the Survey can be transferred, thus providing more room for the geologists, topographers, and draftsmen in the main building. It would be economical on the part of the Government to provide a permanent building for the Survey, as the present rental equals the interest on over $500,000 at 3 per cent.

In the estimates attention will also be called to an increase desired in the appropriations for geology and topography.

While the Survey has grown largely in various directions, the appropriations for these two most essential features are less than they were prior to the reduction in 1893. At least $50,000 should be added to geology and the same to topography, in order to enable the Bureau to meet the demands for surveys and to properly utilize the present office plant.

The Smithsonian Institution, the National Museum, the Coast and Geodetic Survey, the General Land Office, and the Government Printing Office have, as in previous years, cordially cooperated with the Survey in the endeavor to advance and perfect its work. Special acknowledgment is made to the Coast and Geodetic Survey for the promptness and courtesy with which it has responded to numerous requests for information relative to triangulation points and bench marks.

The members of the Survey have rendered diligent and faithful service, and have cooperated with one another and with the Director in carrying forward the work intrusted to them.

PLAN OF OPERATIONS.

The general plan of operations for the fiscal year 1896–97 was laid before the honorable Secretary of the Interior on June 17, 1896, and was approved by him June 22, 1896. The detailed plan as approved by the Secretary is on file in the Department.

The greater portion of the work hereinafter reviewed was executed in conformity with the plans submitted. A general statement of appropriations and of allotments for work in geology, paleontology, and topography immediately follows, and where each field party was employed and what each party and office division accomplished will be found stated further on under the heading "Work of the year" (pp. 22–130).

APPROPRIATIONS.

For the fiscal year 1896–97 there was appropriated for the work of the United States Geological Survey the sum of $568,690. Separate amounts were, by the terms of the act, set apart for specific branches of work and for the salaries of persons connected with these branches. For convenience of reference these separate appropriations are here brought together and classified, as follows:

For pay of skilled laborers, etc		$13,000
For topographic surveys	$175,000	
For pay of two geographers and two topographers	9,200	
Total for topographic work		184,200
For geologic surveys	100,000	
For general investigations in Alaska	5,000	
For pay of four geologists	13,700	
Total for geologic work		118,700
For paleontologic researches	10,000	
For pay of two paleontologists	4,000	
Total for paleontologic work		14,000
For chemical and physical researches	7,000	
For pay of one chemist	3,000	
Total for chemical work		10,000
For gauging streams and determining water supply		50,000
For preparation of illustrations		13,000
For preparation of report on mineral resources		20,000
For purchase of books and distribution of documents		2,000
For engraving and printing maps		60,000
For rent		4,200
Total		489,100

Furthermore, there was appropriated in the same act for engraving, printing, and binding publications of the Geological Survey, $37,000; this sum to be disbursed, not by the Geological Survey, but by the Public Printer. The items are as follows:

For engraving illustrations for the report of the Director	$7,000	
For engraving illustrations for monographs and bulletins	10,000	
For printing and binding monographs and bulletins	20,000	
Total for engraving, etc		37,000

Lastly, the legislative, executive, and judicial act for 1896-97 appropriated for the Geological Survey $42,590, in two items, as follows:

For salaries of Director, chief clerk, chief disbursing clerk, librarian, and photographer, together with clerks, messengers, watchmen, et al. to the number of twenty-nine persons in all	$31,390	
For rent	11,200	
Total		42,590
Aggregate appropriations for the Geological Survey for the fiscal year 1896-97		568,690

ORGANIZATION.

For convenience of administration, the following scheme of organization of the work and business of the Survey has been adopted. Under this the work is primarily divided into four branches, within each of which there are a number of divisions.

BRANCH.	DIVISION.
Geologic	Geology. Paleontology. Chemistry. Hydrography. Mineral Resources.
Topographic	Triangulation. Topography.
Publication	Illustrations. Editorial. Engraving and Printing.
Administrative	Documents, Correspondence, and Records. The Library. Disbursements and Accounts.

ALLOTMENTS.

ALLOTMENTS TO GEOLOGIC WORK.

As stated above, the total appropriation for geologic work for 1896–97, including the special appropriation for work in Alaska, was $118,700. The following table exhibits the allotments that were made to the heads of the several geologic parties:

Party.	Allotment.
Executive office	$9,000
Shaler, N. S. (Rhode Island, Massachusetts, and Virginia)	3,500
Emerson, B. K. (Massachusetts and Connecticut)	750
Dale, T. N. (New York and Vermont)	2,800
Kemp, J. F. (New York)	400
Hobbs, W. H. (New York, Massachusetts, and Connecticut)	400
Wolff, J. E. (New Jersey)	750
White, C. D. (Pennsylvania, Ohio, West Virginia, Virginia, Kentucky, and Tennessee)	1,800
Campbell, M. R. (West Virginia, Kentucky, and Tennessee)	5,700
Hayes, C. W. (Georgia and Alabama)	4,300
Keith, Arthur (Maryland, Virginia, Tennessee, and N. Carolina)	3,000
Clark, W. B. (New Jersey, Maryland, and Delaware)	1,000
Darton, N. H. (D. of C., Maryland, Virginia, and Nebraska	2,000
Eldridge, G. H. (Florida)	3,200

Party.	Allotment.
Van Hise, C. R. (Lake Superior region)	$8,000
Chamberlin, T. C. (Illinois and Central Interior region)	3,000
Gilbert, G. K. (Great Lakes and Nebraska)	5,000
Hill, R. T. (Indian Territory)	5,500
Emmons, S. F. (Colorado and Montana)	7,000
Weed, W. H. (Montana)	3,000
Hills, R. C. (Colorado)	1,000
Cross, C. W. (Colorado)	5,200
Hague, Arnold (Yellowstone National Park)	4,500
Lindgren, Waldemar (Idaho)	4,000
Turner, H. W. (California)	3,600
Lawson, A. C. (California)	500
Branner, J. C. (California)	300
Diller, J. S. (Oregon and Petrographic Laboratory)	5,300
Willis, Bailey (Washington, and office expenses of editing geologic maps)	9,500
Spurr, J. E. (Alaska)	6,800
Becker, G. F. (California)	6,500
Contingent fund	1,400
Total	118,700

ALLOTMENTS TO PALEONTOLOGIC WORK.

The total appropriation for paleontologic work for 1896–97 was $14,000, which was allotted to the several sections of the work as follows:

Section.	Allotment.
Paleozoic work	$1,500
Mesozoic work	2,000
Cenozoic work	2,300
Paleobotany	4,600
Vertebrate paleontology	2,000
General assistant's salary	1,200
Contingent	400
Total	14,000

ALLOTMENTS TO TOPOGRAPHIC WORK.

The total appropriation for topographic work for 1896--97 was $184,200, which was allotted to the several sections of the work as follows:

Section.	Allotment.
Administration	$11,000
Geography	6,000
Atlantic section	52,000
Central section	36,000
Rocky Mountain section	38,500
Pacific section	36,000
Contingent	4,700
Total, including stated salaries	184,200

MISCELLANEOUS ALLOTMENTS.

CHEMISTRY.

For pay of all persons connected with the chemical work, and for the purchase of chemical supplies, apparatus, etc., the entire appropriation of $10,000 was allotted.

HYDROGRAPHY.

The appropriation of $50,000 for hydrography was allotted as follows: $25,000 to the gauging of streams and the determination of the water supply of all parts of the United States; $10,000 to the investigation of the subject of artesian wells and underground currents in arid and semiarid sections; and the remainder, $15,000, to the preparation of reports upon the methods of utilizing the water resources.

The appropriation was apportioned by States as follows:

State.	Allotment.
Arizona	$700
California	2,500
Colorado	2,100
Idaho	1,100
Montana	1,300
Nevada	1,100
New Mexico	1,300
Oregon	600
Utah	1,700
Washington	800
Wyoming	1,700
Dakotas, North and South	1,800
Nebraska	5,000
Kansas	3,500
Texas and Oklahoma	2,000
New England	900
New York and Pennsylvania	900
Virginia and West Virginia	1,000
Carolinas, North and South	1,400
Georgia and Alabama	1,000
Indiana	500

These amounts, with the salaries of the permanent employees of the division and the office expenses, utilized the entire appropriation for hydrography.

MINERAL RESOURCES.

The entire appropriation for the preparation of the report on mineral resources, $20,000, was allotted to gathering and compiling the statistical data for the calendar year 1896, and for the preparation of a report upon the same, which is published as Part V of this Annual Report.

ENGRAVING AND PRINTING MAPS, ETC.

The appropriations for engraving and printing maps, for the purchase of books and distribution of documents, for the preparation of illustrations, for pay of skilled laborers, etc., were allotted and expended for the specific purposes named in the act.

WORK OF THE YEAR.

As already indicated, the general organization of the Survey, by branches and divisions, remained the same as during the previous year.

The approved plan of operations was executed in all essential particulars, such slight departures therefrom as were made being due to conditions arising during the year which could not be anticipated. Following is a detailed statement of the work:

GEOLOGIC BRANCH.

DIVISION OF GEOLOGY.

The geologic field work was carried on by thirty parties, each with a geologist or an assistant geologist at its head, the heads of parties reporting immediately to the Director. As in the previous year, for convenience of administration and reference, the field of operations was divided into six grand divisions or regions, as follows: The New England region, the Appalachian region, the Atlantic Coastal Plain region, the Interior or Mississippi region, the Rocky Mountain region, and the Pacific region.

The work of the year 1896-97 was in the main areal geologic surveying. Considerable attention was directed, however, to special investigations, as will be described in detail further on.

NEW ENGLAND REGION.

This includes the New England States and the eastern portion of New York. In it five parties were engaged, as follows:

Shaler party (*Massachusetts*).—During the field season of 1896, Prof. N. S. Shaler continued the survey of the Cape Cod area of Massachusetts. The work previously done in this locality related to the surface geology only, while that of the last year had reference mainly to the under geology. The area surveyed embraced nearly 300 square miles. This study led to the conclusion that this district represents a portion of a region of ancient topography which has been depressed nearly to the level of the sea, either by recent subsidence or by a rise of the sea; also that the underlying strata of Cape Cod are of Tertiary or Pleistocene age, and that the beds have been dislocated in a peculiar manner, very much as on Marthas Vineyard. The principal economic results relate to the distribution of clays which are of value for brickmaking and coarse pottery work, and to the conditions for further drainage in that region.

Professor Shaler and his assistants also took up the survey of the Mesozoic coal basin near Richmond, Virginia, as related under the heading "Atlantic Coastal Plain region," p. 32.

In the office the elaboration of the field observations made in the Cape Cod district was completed, and a paper embodying the results of the work appears in Part II of this Annual Report.

Professor Shaler also gave considerable time to replying to numerous inquiries concerning road-building stone, a matter to which attention has been directed by papers on the subject published in the Fifteenth and Sixteenth annual reports of the Survey.

Emerson party (Massachusetts).—Prof. B. K. Emerson, with the assistance of Mr Joseph H Perry, continued work on the section extending across Massachusetts from the Connecticut River eastward to the Norfolk Carboniferous basin. This survey included areas in the Housatonic quadrangle, especially west of Norfolk and around Lee, and many additional data were secured within the Worcester quadrangle. Mr. Perry worked mainly in the Mendon and Uxbridge areas.

The final revision of the maps and sections for the Holyoke folio was made, and much petrographic work was done in connection with the study of the Housatonic and Worcester quadrangles.

Dale party (New York and Vermont).—With the assistance of Messrs. L. M. Prindell and L. H. Moffit, Prof. T. Nelson Dale continued the survey of the roofing-slate belt of eastern New York and western Vermont, the Castleton quadrangle of Vermont and the Whitehall and Hoosick quadrangles of New York being included in the area mapped. In all, 241 square miles of areal geology were surveyed in detail, only a portion of which will require much revision before publication.

In addition, Professor Dale spent nearly three weeks in the Pittsfield and Sheffield quadrangles of Massachusetts, certain features of the geology of which had been differently interpreted by Messrs. Emerson, Hobbs, and Dale. He also accompanied the Director to northern Vermont for the purpose of examining certain sections in Franklin County that threw light upon the stratigraphic succession of the rocks in the slate belt.

The scientific results include an understanding of the structural geology of an intricately folded metamorphic region, and particularly the relations of the bodies of roofing slate to surrounding rock masses; the age and structure of Bird Mountain, and the discovery of new localities of Cambrian and Silurian fossils.

The economic results of the work embrace the completion of the field work for a bulletin on the roofing-slate belt of eastern New York and western Vermont, the completion of the mapping of that portion of the slate region that remained unsurveyed at the close of the previous field season, the construction of a section across the slate belt, and the collection of structural data that will have an important bearing upon the future development of the slate industry.

In the office attention was devoted almost entirely to the preparation of the material collected during the last two seasons in the roofing-slate belt, although some time was given to the final revision of the manuscript of Professor Dale's portion of the Pittsfield geologic folio. The petrographic work on the eruptives of the slate belt was undertaken by Miss Florence Bascom, who submitted a report upon them to Professor Dale.

Kemp party (*New York*).—Prof. J. F. Kemp mapped an area of 150 square miles within the Ausable and Elizabethtown quadrangles of eastern New York. It is an area of great structural complexity and difficulty.

The scientific questions are of great interest to the geologist, and pertain to the stratigraphic and structural relations of the rocks, their metamorphism, faulting, displacement, sculpturing, etc. Many of the problems were solved, while others can not be until the work is extended into adjoining areas. One of the scientific results is the ascertainment that the great central mass of the Adirondacks is composed of gabbros and anorthites of later age than the quartzose gneisses and crystalline limestones which surround the central gabbro mass.

The economic results of the work have reference principally to the occurrence of iron ores, the distribution of which will be shown on the sheets of areal geology and the structure sections.

In the office the results of the field work were platted upon enlarged photographic copies of the Elizabethtown and Ausable topographic sheets, the field determinations of the rocks having been verified in the laboratory, when necessary, by a microscopic study of thin rock sections.

Hobbs party (*Massachusetts and Connecticut*).—In continuation of work of the previous season, Prof. W. H. Hobbs reexamined the areal and structural geology of the Sheffield quadrangle of western Massachusetts, and completed work on the Cornwall quadrangle in northwestern Connecticut. A small amount of reconnaissance was also done in the New Milford quadrangle of Connecticut. The areal work included 156 square miles of new survey and 60 square miles of resurvey.

Among the scientific results of the work is the identification of the beds in the western portion of the Sheffield quadrangle as the three lower members of the Greylock series.

In the office a report on that portion of the Sheffield quadrangle which Professor Hobbs had studied was made for use by Professor Emerson in preparing the text for the Housatonic folio of Massachusetts. Professor Hobbs also elaborated the notes taken during the field season.

APPALACHIAN REGION.

This region embraces the mountain system and adjoining hills and plateaus that extend from the Hudson River on the north to central Alabama on the south. In it five parties were engaged in field work, as follows:

Wolff party (*New Jersey*).—In continuation of the work which is being done in northern New Jersey, in cooperation with the State survey, Prof. J. E. Wolff, assisted by Mr. A.

H. Brooks, carried to completion the survey of the Franklin quadrangle, covering an area of about 200 square miles.

The scientific and economic results include the determination of the pre-Cambrian age of the white limestone of Sussex County, and the distribution and relation of certain eruptive rocks. These eruptive rocks are of value for building and road-making purposes. The zinc mines of the area had been previously studied and their geology is fairly well understood.

The office work during the winter and spring consisted of the elaboration of the field observations made in the Franklin quadrangle and of the preparation of a paper, jointly with Mr. Brooks, on the age of the Franklin white limestone, which appears in Part II of this Annual Report.

White party (Kentucky, Tennessee, Pennsylvania, and Ohio).—Mr. C. David White continued his cooperation with Messrs. Campbell and Taff, geologists, who were engaged in mapping the coal-bearing formations of the Appalachian region in Kentucky and Tennessee. The areas visited included portions of the Standing Stone, Williamsburg, London, Wartburg, and Manchester quadrangles. Large collections of plants were made from the different parts of the coal-bearing series of rocks. These show that on the western border of the coal field there was an encroachment of the western shore line during late Pottsville time. In this area the deposits are mainly coarse sandstones, with a few bodies of coal which are now locally workable. They were found to be of Pottsville age, with the possible exception of the Pittsburg coal and the upper coal near the Pine Mountain fault at Jellico, which are perhaps basal Coal Measures.

For the purpose of obtaining more thorough data for the correlation of these coals with those of the Pottsville series, Mr. White studied the sections and collected fossils from the Pottsville series westward to Lorberry Gap, in the southern anthracite field of Pennsylvania, and near Tremont in the western middle field. With the assistance of Mr. B. F. Phillips, of Pittston, fossil plants were collected from the coals that are worked in the Pottsville series, and wherever in the sections it was possible to find fossils of any kind they were secured. A special effort was put forth to make the type section at Pottsville as complete as possible. Mr. White obtained a good section of the Pottsville series, and much material at other points that will enable him to correlate a number of areas of doubtfully workable coal.

He found that at Lorberry Gap, in Sharp Mountain, the boundary of the Pottsville series had been drawn some 15 miles too far north in the published maps of the State survey, and that several of the lower workable veins of Coal Measures coal lie still farther south, in the upturned edge of the basin, quite outside of the area mapped by the final State survey as coal bearing. This long belt, including the upturned, often nearly vertical or overturned Lykens coals, constitutes an important addition to the mapped anthracite-bearing territory.

The type localities of the Sharon and Mercer coals were visited in Mercer County, Pennsylvania, and in Mahoning, Trumbull, and Stark counties, Ohio, in order to study the mode of occurrence and the stratigraphic and paleontologic relations and characters of these horizons. It is anticipated that when the collections are studied further, reliable correlations can be established between the coal beds of Pennsylvania, Ohio, West Virginia, Kentucky, and Tennessee.

In the office Mr. White completed his report on the Flora of the Lower Coal Measures of Missouri, for publication as a monograph, with the exception of the preparation of certain necessary illustrations. The remainder of the time was devoted to study and description of the fossil flora collected from the Pottsville (Lykens) series in the southern anthracite field.

Campbell party (Kentucky and Tennessee).—Mr. M. R. Campbell, assisted by Messrs. J. A. Taff and W. C. Mendenhall, was engaged during the field season in mapping the areal geology along the western margin of the Appalachian coal field in the States of Kentucky and Tennessee. The Richmond and London quadrangles of Kentucky and the Standing Stone quadrangle of Tennessee were completed, as well as the southern portion of the Beattyville quadrangle of Kentucky, the entire area surveyed including 3,533 square miles. Moreover, a thorough reconnaissance was extended over 612 square miles in Kentucky and Tennessee. The areas covered were all new surveys, except the review of portions of the Pikeville and Wartburg quadrangles in Tennessee.

The areal work throws considerable light on the lithologic changes along the line of strike of the various formations of the Upper Silurian, Devonian, and Lower Carboniferous. It includes the determination of the lens-like character of the heavy conglomerates and sandstones of the Pottsville series, a point of great importance in the correlation of the lower coal-bearing rocks and in the determination of the physical conditions prevailing at the time of the deposition of those formations. The party also procured important evidence of a great time break at the base of the Pottsville, which was likewise substantiated by the work of Mr. C. David White in the same region. Considerable information was also gathered respecting the geologic history of the region. Mr. Campbell thinks that a little more work will connect the Cumberland area with the phosphate region of western Tennessee, which was studied by Dr. C W. Hayes the previous year, and thus give a starting point for the interpretation of the physical development of the Mississippi Valley.

The major portion of the district worked is embraced in the coal field, but much of it is barren of workable coals. The results, however, are of great importance in revealing more clearly the workable areas, and thus rendering possible a better estimate of the value of the region for coal. Petroleum is being found in many places throughout the area. Mr. Campbell was unable to determine any relation between the surface geology and the deposits of oil, and therefore can make no prediction except in so far as the supply has been tested by the drill. The region is free from marked structural features. The few that do occur seem to be of little or no worth to one desirous of determining the presence or absence of oil.

In the office Mr. Campbell's work consisted mainly of the preparation of material for publication. Messrs. Campbell and Taff prepared the manuscript for the London and Richmond folios, and they were submitted for publication. The notes of the Standing Stone quadrangle were platted, ready for transfer to the topographic base map when the latter shall have been engraved.

Hayes party (Georgia and Alabama).—A large part of the field season was given by Dr. C. Willard Hayes and his assistant, Mr. A. H. Brooks, to a resurvey or reexamination of the Dalton, Fort Payne, Rome, Cartersville, Anniston, and Tallapoosa quadrangles of Georgia and Alabama, an area of 2,225 square miles being thus covered. Some reconnaissance work was done to the east and south of the region embraced by the quadrangles named, chiefly in the Suwanee, Atlanta, and Ashland quadrangles, the reconnaissance covering 370 square miles; and a new and complete survey was made of the Marietta quadrangle, 1,000 square miles, and also of 120 square miles of the Atlanta quadrangle. The field work so far done furnishes complete data for the Dalton, Rome, Cartersville, Tallapoosa, and Marietta folios.

In the above work special attention was given to the structure of the metamorphic sediments constituting the Ocoee series and their relations to the intrusive igneous rocks and the fundamental crystalline complex. A considerable area which had been previously regarded as occupied by clastic rocks was found to be underlain by a gneiss older than the clastic rocks, probably Archean. The formations representing the Ocoee series southwest of the Etowah River differ considerably from those toward the northeast, appearing to be made up largely of igneous rocks, with which are associated lenses of conglomerate and graphitic slates. Metamorphism and decay among these rocks have been great. In the Marietta quadrangle six types of crystalline rocks were differentiated, in addition to the members of the older crystalline complex.

The deposits of talc occurring at various points in the area studied were specially examined. They are found to be derived by alteration from basic intrusives, and their extent can thus be clearly defined. The study of the gold resources made during the two previous seasons was continued, and the auriferous belts were mapped as accurately as possible. Considerable activity is being manifested in the development of the gold deposits of this region, and the consequent prospecting afforded unusual facilities for underground examination. Among the crystalline rocks of the Marietta region are several varieties, chiefly granites, which are well adapted for building stones. These were carefully examined, and mapped as accurately as the character of the exposures permitted. A special study was made, in field and office, of the Stone Mountain granite of Georgia, with reference to its qualities as a building material.

In the office Dr. Hayes devoted most of his time to manuscript for folios, in connection with the preparation of a monographic report on the entire region thus far mapped by him in the southern Appalachians. Mr. Brooks made a thorough petrographic study of all material collected in the region during several seasons and prepared notes for publication, both in the folios and in the final report. Dr. Hayes regards Mr. Brooks's work as the most complete petrographic study of the rocks of the southern Appalachian region that has yet been made.

The Cartersville and Marietta folios have been prepared for publication, but little work has been done upon the manuscript for the other folios mentioned, because the final topographic bases are not ready

Keith party (*Virginia, Maryland, and North Carolina*).—Mr. Arthur Keith made a new survey and a reconnaissance in the Morgantown quadrangle of North Carolina, and resurveys of the Roan Mountain and Cranberry quadrangles of the same State and of the Mount Vernon and Frederick quadrangles of Virginia and Maryland. Of new survey he completed 135 square miles, and of reconnnaissance 125 square miles, while 570 square miles were covered by resurveys. Eighteen days were spent with Professor Van Hise in reviewing the structural features in the Cranberry region and the Ocoee belt of North Carolina.

The scientific results of the work relate to structure and stratigraphy, and are of much geologic importance. Among the economic results is the determination of the genesis and relations of the magnetite, silver-lead, gold, and brown hematite deposits; also the location of mines and openings for ores.

In the office Mr. Keith elaborated the notes taken during the previous field season, and revised the text and maps for the Wartburg folio and submitted it for publication. The proof of the Briceville folio was read, and the first draft was made of the areal geology of the Mount Vernon and Frederick quadrangles in Maryland and Virginia and of the Nantahala quadrangle of North Carolina. The geologic boundaries in Maryland and North Carolina, within the area which Mr. Keith has surveyed, were drawn by him, as far as known, and transmitted to the chiefs of the respective State surveys, to be used in connection with the preparation of State maps. A preliminary report on the geology of the Cranberry iron district of western North Carolina was drafted, and the preparation of the final report was begun.

ATLANTIC COASTAL PLAIN REGION.

This area embraces the coastal-plain region extending from the mouth of the Hudson on the north to the Gulf of Mexico on the south. In it four parties were at work.

Clark party (*New Jersey, Maryland, and Delaware*).—In continuation of the study and mapping of the Cretaceous and Tertiary formations of the northern Atlantic slope, Prof. W. B. Clark first slightly revised part of his earlier work in the southern counties of New Jersey, then did some complete areal mapping in the region farther south, and finally made a reconnaissance in eastern Maryland and Delaware. The limits of the upper Cretaceous formations are practically embraced within the region here indicated. The areal work of the season consists of 400 square miles of complete survey and 200 square miles of resurvey, besides about 500 square miles of reconnaissance.

The scientific results of the work relate chiefly to the upper Cretaceous and Tertiary formations, especially to the remarkable changes that have occurred among the upper Cretaceous deposits. The economic products in the clay and marl beds have been studied and statistical information has been obtained concerning them. There is a considerable and increasing demand for the important clays of both the Potomac and

Matawan formations, while the upper Cretaceous and Eocene marls are growing in favor.

In the office Professor Clark elaborated and studied the notes made and conclusions reached during the field season.

Darton party (District of Columbia, Maryland, and Virginia).—Mr. N. H. Darton made several short excursions to secure data and photographs for a report on the geology of the region about the District of Columbia, which has been in course of preparation for several years. Considerable new information was obtained in regard to the underground water resources of the District and vicinity. He also gave attention to the progress of the deep-well boring at Norfolk, Virginia, which has been sunk at his suggestion with a view to thoroughly testing the underground water resources of the southeastern part of that State; and he supplied much information, mainly by correspondence, to persons desirous of finding underground waters in various portions of the Atlantic Coastal Plain in Virginia and Maryland, which led to the sinking of a number of productive wells.

Mr. Darton also did a large amount of work in South Dakota and Nebraska in connection with the Division of Hydrography (see p. 73).

Shaler party (Virginia).—In addition to his work in Massachusetts, Professor Shaler took up the survey of the Mesozoic coal basin near Richmond, Virginia. His assistant, Mr. J. B. Woodworth, aided by Mr. George B. Richardson, completed the determination of the boundaries of the main basin and gathered such information as was obtainable relating to the outcrops in the interior of the principal coal field and to the position and direction of the various dikes which break through the coal. The first object of the work was to obtain information which might guide further search for the coals and natural cokes of this field, especially data concerning the dislocations produced by faulting and folding. A considerable body of new evidence was obtained, which will be presented later in maps and text descriptive of the basin.

Eldridge party (Florida).—The survey of the mineral phosphate belt of Florida was begun by Mr. George H. Eldridge early in the spring of 1896, and has been continued almost uninterruptedly throughout the year.

The area surveyed includes 3,700 square miles, being far in excess of the estimate in the early years of the industry. It lies wholly within the Florida hard-rock phosphate belt extending from Tallahassee to Dade City, paralleling the Gulf. The area thus covered can hardly be designated "new," and yet much of it is such, preliminary journeys only, through one portion or another of it, having been made in former years with a view to acquiring a general idea of the geology and of the character and extent of the phosphate deposits. In addition to the foregoing a hasty review has been made of the land and river pebble district of southern Florida, which was studied in considerable detail in earlier years.

The areas of the topographic atlas sheets of Florida thus far published lie wholly or partly within the region in which the hard-rock phosphates are found. In the Williston, Dunnellon, and Tsala-Apopka quadrangles sufficient geologic data have been obtained to admit of the publication of the folios. For the others, which lie only partially within the phosphate belt, the geologic data are still incomplete. The General Land Office map will be made the base for the geology of areas beyond the limits of the published topographic atlas sheets.

The scientific results of the work include the determination of the geologic formations, their characteristics, distribution, and interrelations. The economic results comprise the nearest possible delineation of the outlines of the deposits, a knowledge of the character and occurrence of the deposits sufficient for advantageous application in mining, and complete notes upon mining methods and the subsequent treatment of the product prior to its manufacture into acid phosphate.

INTERIOR OR MISSISSIPPI REGION.

This region is limited by the British boundary on the north, the Gulf of Mexico on the south, the Rocky Mountains on the west, and the western slope of the Appalachians on the east. In it four parties were at work, as follows:

Van Hise party (Lake Superior region).—The areal work of the field season of 1896 was confined to the Menominee district. Next to the Marquette this is the most important iron-producing district in Michigan. The survey was made with reference to the preparation of a monographic report rather than for the purpose of mapping the areal geology on the topographic base maps; the work was therefore done in great detail, all ledges in the area being accurately located and, so far as practicable, the records of all underground work being secured. The area covered is about 200 square miles in extent. In addition 30 or 40 square miles of reconnaissance work was executed, almost entirely by Messrs. W. S. Bayley and J. Morgan Clements, assistant geologists, and Samuel Weidman, field assistant, although Professor Van Hise spent a short time laying out the work and getting it under way.

Among the scientific results is the confirmation of the conclusions previously announced with reference to the south shore of Lake Superior; viz, that there are three unconformable series of rocks below the Keweenawan, the two upper series constituting the Huronian. It is expected that the iron-ore areas in the Menominee district, as in other districts of the Lake Superior region, will be platted with great accuracy, and that the principles governing the occurrence of the ores will be fully set forth.

The difficult stratigraphy of the district was successfully determined. The iron-bearing formations throughout the district were accurately mapped, and the various belts were for the first time structurally connected. The ore deposits were found to be located in pitching troughs, as in other portions of the Lake Superior region. These troughs are produced by sharp complex folds of the formations. In this district, as in the others, the Huronian rocks may be grouped in two divisions, an upper and a lower. However, because of the close folding, the break between these series is not so strongly marked as in the Marquette district.

The larger portion of Professor Van Hise's time during the field season was devoted mainly to the investigation of points of difference that had arisen among the geologists who had worked in various areas in the older Paleozoic and upper

Paleozoic rocks of the southern portion of the United States. He first visited the Sheffield and Cornwall quadrangles of Massachusetts, with Prof. W. H. Hobbs, to study the succession of formations there and determine upon the nomenclature to be employed. He next went to the southern Appalachians for the purpose of studying the stratigraphy of the Ocoee series of eastern Tennessee, western North Carolina, northwestern Georgia, and northeastern Alabama. In this work he had associated with him at different times Messrs. Arthur Keith, J. A. Holmes, George W. Stose, C. W. Hayes, and E. A. Smith. As a result of these studies the stratigraphic relations of the Ocoee series were tentatively determined, but as the particulars are somewhat complex, and as they have not yet been confirmed by detailed study, it is thought that the publication of the conclusion at this time would be premature.

Professor Van Hise also has charge of the work of Miss Florence Bascom on the crystalline rocks of the Philadelphia quadrangle. Miss Bascom worked out the stratigraphy northwest of the Bryn Mawr gneissoid granite, and began a study of the stratigraphic position of the broad belt of Philadelphia gneiss.

In the office Professor Van Hise gave a large amount of time to reading proof and preparing the index to Monograph XXVIII, on the Marquette Iron-bearing District, in which he was assisted by Messrs. Bayley and Leith. He also gave considerable time to a revision of the manuscript of a memoir on the Crystal Falls and Metropolitan District, prepared by Messrs. Clements and Bayley; also to the preparation of a general treatise on metamorphism and metamorphic rocks, the entire outline and about half of the first draft of which are completed.

Hill party (Texas and Indian Territory).—In the plan of operations for the year it was proposed that Mr. R. T. Hill should make a reconnaissance of the Indian Territory, extending the work southward and westward into Texas. Mr. Hill began the work as planned and made some observations in the region between South McAlester and Muskogee, when he was taken ill and was forced to abandon operations for the season. The work was carried forward, however, by Mr. T. Wayland

Vaughan, assistant geologist, in connection with the work assigned to him under the original plan. Accompanied by Prof. L. F. Ward, Mr. Vaughan traversed the country northward to Coldwater, Belvidere, and Medicine Lodge, Kansas. From Coldwater he proceeded south and west through a part of Oklahoma, finally reaching Mountain City, in that Territory, whence he proceeded to make a reconnaissance of the Wichita Mountains. He then journeyed back to Indian Territory and into the country of the Choctaw Nation. The object of this journey was to obtain a general knowledge of the geologic and topographic features of the region traversed. The Carboniferous and alluvial formations were studied, as were the Cretaceous, and fossils were collected at a number of places. Around Lehigh, Choctaw Nation, more detailed studies were made, especially of coal, and an attempt was made to ascertain the approximate position of this coal seam in the columnar section. The basal portion of the Carboniferous was studied at this point, as were the relations between the limestones and granites.

Mr. Vaughan's chief work was the mapping of the areal geology of the Uvalde quadrangle of Texas, with special reference to the water supply. This he did in great detail, examining carefully the resources in artesian water, coal, asphaltum, etc. The area mapped in detail is 500 square miles in extent, while the reconnaissance covered 250 square miles.

The economic and scientific results of the work in the Uvalde and adjoining Brackett quadrangles are closely connected, and can best be discussed together. Mr. Vaughan's studies indicate that the conditions are almost hopeless for artesian water, the country being so much disturbed by faults, folds, and basaltic intrusions. Numerous data were obtained regarding wells, springs, etc., which show that a permanent supply of water from wells (nonflowing) sunk in the gravel deposits along the streams is obtainable. The asphalt of the Brackett quadrangle, occurring along Turkey Creek and neighboring streams, is an impregnation of a porous limestone made up of shell fragments. It is found in the bottom of a shallow syncline having a north-south axis. An asphalt deposit occurs in the

Nueces River from 8 to 16 miles below the Southern Pacific Railroad crossing, the material here being an impregnation of a very loose sandstone. The structure has not been fully worked out, but apparently the asphalt occurs, as in the other case, in a flat synclinal basin.

In the office Mr. Hill was largely engaged in the preparation of a memoir on the underground waters of Texas. A portion of this was prepared as a paper on the underground waters in the vicinity of San Antonio, which appears in Part II of this Annual Report. This paper deals with one of the most important artesian systems of Texas. The text and maps of the Nueces folio were submitted for publication, and work on the Brackett, Austin, and Uvalde folios was advanced. Mr. Vaughan wrote out the field notes, and also continued the preparation of a monograph on the Eocene corals of the United States.

(For Chamberlin and Gilbert parties, see pages 54–60.)

ROCKY MOUNTAIN REGION.

This region, embracing the Rocky Mountains and their foothills, lies between the British and Mexican boundaries on the north and south, the margin of the Great Plains on the east, and approximately the line of the one hundred and nineteenth meridian on the west. Five parties were here at work.

Emmons-Weed party (*Montana*).—Messrs. S. F. Emmons and W. H. Weed cooperated in field work in Montana. The principal work was the economic survey of the mining district of Butte, which, as represented on the Butte special map, covers an area of 25 square miles. The work was extended far beyond the limits of the map, however. The areal geology—that is, the outlining of the various formations appearing on the surface—was the special work of Mr. Weed; while Mr. Emmons, assisted by Mr. G. W. Tower, had charge of the underground observations in the mines. The underground work consists in tracing the veins in depth as far as developed by the workings of the different mines, and studying their mode of formation, their mineral composition, the nature of the fractures along which they have been deposited, and the paragenesis of the different vein materials.

In order to ascertain the age of the different eruptive rocks and the orographic movements which have produced the vein fractures of the district, it was determined to extend a reconnaissance survey to the periphery of the great granite body of which Butte is approximately the geographic center. For this purpose Mr. Weed made preliminary examinations throughout an area about 50 by 60 miles square, and Mr. Emmons personally examined some of the critical points of contact of the granite with the surrounding sedimentary formations, as thus determined by Mr. Weed.

In addition to the general field work, Mr. Emmons and Mr. Tower made hasty studies of important mine developments in the periphery of the granite region in which Butte is situated. Among the more important of these are the Mayflower mine in the Tobacco Root Mountains southeast of Butte, the Cable mine near Anaconda, and the Elkhorn mine near Boulder.

It is yet too early to indicate the results of this work, whether scientific or economic, as a large proportion of the results obtained by underground work in general are arrived at only after a considerable amount of office work has been done. The facts determined in regard to the Butte district are: (1) The basic granite, the oldest country rock of the region, is post-Carboniferous (and possibly more recent) in age. (2) The acid aplitic granite, which stands next in importance and extent as a country rock, is a later eruptive, probably an alternative phase of eruption of the same magma. (3) The "Big Butte" is the center of eruption, or a volcanic neck whose material has been poured out since the veins carrying gold, silver, and copper were formed. The rock of which it is composed will probably be found not to differ essentially in chemical composition from the granitic rocks in which the economically valuable ores occur. The date of this eruption was probably that of the effusive rhyolite which borders the district on the northwest. (4) There is evidence in the mines of two general periods of dynamic movement by which the rock fractures that admitted mineralizing solutions have been produced; also that there have been successive concentrations of metallic minerals after these movements.

The investigation was undertaken too late in the history of the district to enable Messrs. Emmons and Weed to make their work of much immediate practical advantage to the mine owners. It is probable, however, that the mapping of all the veins and the ,discuss on of the fracture systems and of the probable methods and succession of deposition of metallic minerals, will inure to the advantage of the miners in ways that can not at present be seen. The great and certain result of economic importance to the mining industry in general will be the accurate delineation of the various phases of ore occurrence in this remarkable district, which ranks in importance with that of Leadville and the Comstock.

The reconnaissance examinations of other mining districts and regions made during the summer, while not sufficiently refined or detailed to justify the publication of individual reports, have materially enlarged the sum of Mr. Emmons's information in regard to the methods of ore deposition, which differ somewhat in different localities, and will doubtless be of much service in making generalizations on the subject.

During the winter a special folio of the Butte district has been prepared, which shows the geology and vein systems, and is accompanied by suitable explanatory text. The final report on this district is well advanced, and as soon as the various chemical analyses and other details are available it will be taken up and completed.

Weed party (*Montana and Arkansas*).—In addition to the areal geology in the Butte district, which has been mentioned above in connection with the work of Mr. Emmons, Mr. Weed, assisted by Mr. L. V. Pirsson, made a special detailed geologic survey of the Judith Mountains, the greater portion of the areal work being done by Professor Pirsson while Mr. Weed was engaged in the Butte district. Mr. Weed also visited the northwestern corner of the Yellowstone National Park, in order to complete the areal mapping of a small region not previously studied. He then proceeded to Magnet Cove and Hot Springs, Arkansas, to make a study of the relations of the igneous rocks of the former locality and of the mineral waters of the Hot Springs, for comparison with similar phenomena in Montana.

His areal work may be summarized as (1) the detailed mapping, with the assistance of Professor Pirsson, of 300 square miles in the Judith Mountains, Montana; (2) the mapping of about 15 square miles in the northwestern corner of the Yellowstone Park; and (3) the detailed mapping of the Butte district. He also extended reconnaissance work over an area some 3,000 square miles in extent adjacent to Butte, Montana, and over the area covered by the Hot Springs special sheet, Arkansas.

During the winter Mr. Weed prepared a report on the geology and mineral resources of the Judith Mountains, which is published in Part III of this Annual Report. He also worked up the notes of the survey of the Butte district used in the preparation of the Butte special folio, and wrote out his notes on many of the outlying mineral deposits of Montana, including those of the Elkhorn mine, the Drumlummon, the Mayflower, and others equally prominent.

Hills party (*Colorado*).—Mr. R. C. Hills continued the survey of the Elmoro, Trinidad, and Walsenburg quadrangles, in southern Colorado, completing 550 square miles of new work and 700 square miles of revision.

The scientific results include additional evidence bearing upon the relative age of the Spanish Peaks eruptives, and data as to the character of the eruptives of the Raton Mountains; also evidence of considerable erosion of the Jurassic formations preceding the deposition of the Dakota sandstone. The economic results are additional evidence regarding the value of the eastern portion of the Raton coal field, and observations on the underground water supply and the relative value of the more impervious strata in connection with the storage of water in reservoirs.

In the office considerable time was given to chemical investigations of eruptive rocks and to study of thin sections representing some of their numerous occurrences in the districts examined. Complete analyses were also made of the ashes of samples of coke from the ovens at Elmoro, Starkville, and Sopris.

Cross party (*Colorado*).—Assisted by Messrs. A. C. Spencer and C. W. Purington, Mr. Whitman Cross made surveys of the Telluride and La Plata quadrangles of southwestern Colorado. The topography is upon the scale 1:62,500, and each quadrangle embraces about 245 square miles. The Telluride quadrangle was nearly finished in 1895, and has been completed during the past season. The La Plata quadrangle was completed with the exception of about 20 square miles. The total area surveyed is about 250 square miles. Of the Rico quadrangle a reconnaissance only was made.

The La Plata quadrangle embraces nearly all of the La Plata Mountain group and a region of lower country adjacent. The mountains form a compact group, about 50 square miles in extent, with several summits rising above 13,000 feet in altitude. The group lies some 30 miles southwest of the San Juan Mountains, in the area of upturned sedimentary formations between the great plateau country and the San Juan Mountain complex. The section of sedimentary formations extends from the upper Carboniferous to the Fox Hills Cretaceous, and in the La Plata Mountains are many intrusive masses of diorite and diorite-porphyry. The results of scientific importance may be summarized as follows:

Concerning the La Plata Mountains, it may be said that the reconnaissance survey under Hayden was obliged to leave the stratigraphy of the mountains undetermined. The entire central area was mapped as "metamorphic Paleozoic." In this area Mr. Cross has recognized and mapped the Carboniferous, Trias, and Jura in four formations, and a large number of eruptive masses have also been outlined. The fossiliferous Triassic formation which was determined and mapped in the Telluride region last year has been traced through the La Plata Mountains. In this district and for a long distance to the east two quite distinct divisions are recognizable within the Jura, and it is proposed to map both divisions in this area. The development of the shales of the middle Cretaceous is also very interesting as compared with that of the same formation on the eastern slope of the Rocky Mountains. Here no formation boundary can be drawn between the Dakota and the Fox Hills. The Benton, Niobrara, and Pierre divisions are united in one large shale formation, in which Mr. Cross has been unable to discover any continuous horizons available for the tracing of boundary lines, although fossils found here and there indicate that all three divisions named are represented.

The igneous rocks of the mountain group have also been carefully studied, diorite-porphyry and granular diorite being the predominant types. Both rocks are presumably of early Tertiary age, and belong to the great series of similar eruptives now known to have such a wide range in the Rocky Mountains. The occurrences of the La Platas are exceptionally favorable to a correct determination of the significance of such rocks in their bearing upon petrographic classification and the origin of rock structures.

The work in the Telluride district has resulted in the acquisition of a mass of information about landslides on a gigantic scale; such as occur here have probably no parallel in any other district of the United States.

While past explorations have not shown the existence of large ore deposits of great value in the La Plata Mountains, it is certain that what prospecting has been done there has been carried on without any correct idea of the geology; and yet there has been more apparent effort to work on the idea suggested by the old Hayden geologic map than in almost any other district known to Mr. Cross. The map he is preparing will be of great value as a guide, whatever the result.

In order to obtain adequate information in regard to the economic features of the La Plata, Rico, and Telluride quadrangles, Mr. Purington made a study of the mines and prospects in each of these areas, and as a result of his work it will be possible to give much information in the folios, and also in more elaborate form in special reports. He worked with map in hand, the object being to place upon the economic sheet of each folio all that can be expressed thereon, and in his reports the ore deposits will be classified and their intimate relation to the geology of the districts in which they occur will be pointed out. This work should be of value in the exploration of known deposits and in the discovery of new ones.

Since returning from the field Messrs. Cross and Spencer have been principally engaged in elaborating and systematizing the results of field work in 1895 and 1896, and in preparing the Telluride folio for publication. The La Plata folio is well advanced and the Telluride folio is completed. Considerable time was also given to the compilation of the results of previous investigations for use in the San Juan region. Mr. Purington completed a report on the Telluride mining district, which will be found in Part III of this Annual Report, and put other results into shape to be used in the preparation of the La Plata and Rico folios. Mr. Cross also prepared a report on the volcanic rocks occurring at and near the Leucite Hills, Wyoming, and wrote a description of the volcanic rocks of the Uvalde and Brackett quadrangles of Texas; and Mr. Spencer examined and described the igneous rocks collected in Indian Territory in 1896 by Mr. Vaughan.

Hague.—Mr. Arnold Hague was detailed to serve on the Forestry Commission, and therefore did not do any field work for the Survey. After the return of the Forestry Commission and the drafting of a report, most of his time was given to the study of material to be used in the preparation of Monograph XXXII, on the Yellowstone National Park. In this connection he gave much time to the final arrangement and proper labeling, numbering, and cataloguing of the large collection of geologic specimens obtained from the Yellowstone Park during the years in which the survey of that region was being made. The arrangement and marking of the collection is now completed, and one-third of it is properly labeled and catalogued.

PACIFIC REGION.

This region embraces the expanse of country lying between the Pacific Coast and the one hundred and nineteenth meridian, approximately. In it field work was carried on by seven parties.

Lindgren party (Idaho).—Mr. Waldemar Lindgren made a complete survey of the Boise quadrangle and a survey of the northwest quarter of the Idaho Basin quadrangle. A total area of 1,096 square miles was mapped. In addition to this detailed or final work, late in the season a reconnaissance was made of the Silver Crown district near Cheyenne, Wyoming, an area of 20 square miles being covered.

The mapping of the Boise quadrangle was begun July 1 and completed September 15. This area, which is located on the northern side of the Snake River Valley, consists geologically of a granitic range against the flanks of which rests an extensive series of Tertiary lacustrine and fluviatile deposits in which many volcanic flows of differing nature are embedded. These Tertiary beds, which occupy at least one-half of the Boise quadrangle, were carefully studied, and they afford a key to the late geologic history of the Snake River Valley. The oldest and most extensive series of lake beds are of Miocene age, and contain in places an abundant fossil flora, which has been studied by Professor Knowlton.

Several mining districts are located in the granitic rocks of the Boise quadrangle. The deposits, which are as a rule gold-bearing fissure veins, were examined, and special attention was given to the processes of alteration—as metasomatism—to which the rocks adjoining these deposits have been subjected.

The mapping of the northwestern quarter of the Idaho Basin quadrangle was begun September 15 and concluded October 15. This area, which forms an isolated intermontane valley, received especial attention in view of its past large production of precious metals and of its future possibilities. Both the placer mines, which have been extensively exploited, and the quartz mines, where but little work has been done, were carefully examined and found to present many interesting and complex features. The placer deposits were in all cases traced up to the larger vein systems.

In the office Mr. Lindgren prepared the text of the Pyramid Peak and Truckee folios of California, and the topographic corrections for the Colfax (California) sheet. He also wrote a special paper on the mining districts of the Idaho Basin and the Boise Ridge, which is incorporated in Part III of this Annual Report. Besides these, the manuscript for the Boise folio was completed and a short report on the Silver Crown district of Wyoming was prepared.

Turner party (*California*).—Mr. H. W. Turner's principal work was the areal mapping of the Big Trees quadrangle of California, which was commenced July 20. Mr. Turner was assisted most of the time by Messrs. F. L. Ransome and H. F. Poindexter, as temporary field assistants.

Reconnaissances of the Big Trees district had been made at various times in previous years, and in the northwest and southeast corners about 200 square miles had been geologically mapped. The remaining 800 square miles were mapped last season. During October some geologic work was done by the party in the Yosemite district, about 50 square miles being resurveyed and mapped in the southwest corner of the quadrangle. Altogether, in the Big Trees and Yosemite quadrangles, about 850 square miles of geologic mapping were completed.

There had been previously found in the Big Trees district an interesting set of lavas which approximate to trachytes in composition. Certain massive forms of these lavas resemble basalt, while others which contain biotite have a fragmental appearance. These lavas do not appear to exist north or south of this portion of the range, and are the first Tertiary rocks of this type known to occur in California.

Numerous gold-quartz mines were noted in the western part of the Big Trees district, and a few in the Yosemite, some of which are in the Yosemite National Park. In the west and southwest part of the Big Trees district many areas of gold-bearing gravels were outlined. Marble is found in practically inexhaustible quantity in the southwest portion of the Big Trees and Yosemite districts. It is at present but little quarried on account of the lack of transportation facilities.

In the office Mr Turner's time was devoted mostly to matters relating to the folios of the Gold Belt of California. The Downieville, Sonora, and Bidwell Bar folios have been prepared for publication. As a member of the committees on petrographic nomenclature and on the system of work for the petrographic laboratory (see pp. 14, 15), Mr. Turner gave some time to questions before these committees. He also assisted Prof. J. C. Branner in making a study of the thin sections of about fifteen of the metamorphic rocks that occur near Palo Alto, California. About two weeks' time was given in the laboratory of the Survey to the separation of the constituents of several rocks for chemical analysis, and preparatory studies were made in anticipation of continuing the survey of the Yosemite quadrangle during the season of 1897.

Lawson party (*California*).—Continuing the study and mapping of the region adjacent to the Bay of San Francisco, Prof. Andrew C. Lawson mapped 110 square miles of the Tamalpais, 48 square miles of the Haywards, and 10 square miles of the Concord quadrangles; and in the area last named he also resurveyed 8 square miles. In addition, Professor Lawson examined and mapped in detail, with the aid of temporary field assistant Dr. W. S. T. Smith, the Island of San Clemente. The study of the Tertiary paleontology of the region has been continued by Dr. J. C. Merriam, who served as a volunteer assistant.

In the office Dr. Lawson gave considerable time to the petrographic study of the collections of rocks made in various portions of the areas surveyed by him. Dr. Merriam continued his voluntary investigations of the fossils of the Cretaceous and Tertiary formations, and Dr. Smith completed a memoir on the geology of San Clemente Island, which appears in Part II of this Annual Report.

Branner party (*California*).—Prior to beginning work under the auspices of the United States Geological Survey, Dr. J. C. Branner had spent considerable time upon the geology of the Palto Alto quadrangle in connection with his position as professor of geology in the Leland Stanford Junior University. During the field season he devoted part of the time to the detailed study of. the geology of that quadrangle, with a view to folio publication. The work thus far consists almost entirely of field observations and notes and the collection of data for the folio report. About 50 square miles have been examined, most of it in detail. This area is nearly all in the western half of the quadrangle, extending from west of Redwood eastward to Mountain View and southward to the top of the Santa Cruz range.

The fossiliferous rocks exposed range from the Cretaceous upward, while some of the metamorphosed beds are probably older than Cretaceous. The rocks consist of schists, jaspers, basalts, serpentines, and several other igneous kinds not yet studied. Fossils are not abundant except at a few points. Some Cretaceous (?) fossils have been found in inclusions in the andesites.

The lignite beds in this quadrangle are not likely to prove valuable. The maps will show the distribution of the limestones and also that of the buff-colored sandstones of which the Leland Stanford Junior University is built. Some silver ore has been found on the University estate, and it has also been traced for several miles across the quadrangle. Clays of economic value are abundant in the Miocene beds, but they are not utilized as yet. The andesites are extensively used as road metal, especially in localities where stream gravels are not convenient or abundant. It is expected that the study of the geology of the Santa Clara Valley will throw some light upon the artesian water supply of that belt.

In the office Dr. Branner mapped the results of field work and wrote out his field notes. It is anticipated that it will take considerable time to complete the survey of the quadrangle, as the work must be done slowly and carefully, owing to the complicated character of the geology and the fact that only a small sum can be allotted for this field work.

Diller party (*Oregon*).—In conformity with the plan of operations, Mr. J. S. Diller made complete surveys of the Roseburg and Crater Lake quadrangles of Oregon. The number of square miles covered by areal work was 1,088—in the Roseburg quadrangle 871, and in the Crater Lake 217. Of the former, about 260 square miles were mapped by Mr. A. J. Collier, special assistant.

Nearly all of the area surveyed was practically new, although some preliminary work in the Roseburg region was done during the season of 1896, in a reconnaissance of northwestern

Oregon. In the Roseburg quadrangle nine sedimentary and seven igneous formations were recognized and outlined upon the map. The relations of the formations are indicated in the following tabular scheme:

Formations in the Roseburg quadrangle, Oregon.

Age.	*Sedimentary.*	*Igneous.*
		Basalt. Rhyolite.
Neocene(?)	Oakland shale.	Andesite.
Eocene	Tyee sandstone. Umpqua. Wilbur.	Diabase.
		Porphyritic rhyolite. Serpentine.
Cretaceous	Myrtle. Whitsett limestone. Radiolarian chert.	
		Metagabbro.
	Schists.	
Carboniferous(?)	Flint limestone.	

The details of the various formations will be given in the descriptive text accompanying the Roseburg folio.

Crater Lake, with a depth of 2,000 feet, lies in the heart of the Cascade Range, engirdled by continuous and almost impregnable cliffs. This remarkable topographic feature merits special mention, not only on account of its great scenic features, but also because it is unique, and affords an excellent opportunity for the observation of the results of a rare form of volcanic action. The scientific results of the Survey work in that region, aside from the mapping of the rocks, refer chiefly to the geologic history of the lake.

There was once an extensive system of glaciers in the Crater Lake region, and their distribution, as shown by the glacial moraines and striæ, which have also been mapped, clearly indicates that at the time of the Glacial period the topography of this region was very unlike that of to-day. In fact, Crater Lake did not then exist, but upon its site was a mighty mountain, comparable in size with Shasta or Rainier. Since then the great mountain has disappeared by subsidence, producing an enormous pit 6 miles in diameter and 4,000 feet deep. Several smaller volcanoes developed in the bottom of the pit and partially filled it, and water has accumulated until the pit is half full, forming Crater Lake, which is without visible outlet. The rocks in the rim of the lake were found to be wholly volcanic, of comparatively recent origin, and to belong to the three types, andesite, rhyolite, and basalt.

In the Roseburg region coal, gold, copper, mercury, marble, cement rock, and a variety of building stones have been found, and their distribution has been investigated. Coal has been taken out for local use at several places, and the placer gold mines have been worked along several streams for years at a small profit. At the present time there is active prospecting along the contact between the diorite and the serpentine, as well as in the body of the serpentine. The mineral resources of the Crater Lake region are of little value, and yet the place will be of great economic importance to the State when a proper appreciation of this remarkable locality as a resort for pleasure, health, and instruction is aroused among the people.

In the office Mr. Diller worked up the field notes of the Roseburg quadrangle, and the geologic map, sections, and text for the Roseburg folio are well advanced. Several short papers upon Crater Lake were also prepared. Most of his time, however, was given to the preparation and completion of a bulletin to accompany the Educational Series of Rocks, reference to which has been made in the introduction to this report (p. 14).

Mr. Diller has charge of the petrographic laboratory, the work of which is done by Messrs. F C. Ohm, W. S. Roberts, and several temporary assistants. During the year 4,219 thin sections of rocks were prepared, and about 100 specimens were cut and polished for study.

Willis party (Washington).—Mr. Bailey Willis's work was directed to the investigation of two distinct subjects. The first of these was a reconnaissance, of eight days' duration, of the glaciers of Mount Rainier, made in association with Prof. I. C. Russell, of the University of Michigan. The area examined comprised approximately 100 square miles, but no geologic mapping was undertaken. Mount Rainier was approached by way of Carbon River, on the north side, and the route pursued during the examination extended up the Carbon River glacier, around the mountain at an elevation of 6,000 to 10,000 feet to the eastern side, over the summit, and down the southern side and back to the Carbon River glacier, partly over the previous route. Professor Russell also made an excursion toward the west, and thus covered during the trip the entire height of the mountain and about three-fourths of its circumference.

The investigation of the glaciers showed that they exhibit in a very striking manner the conditions of accumulation, flow, and stagnation of the ice, and that they afford a remarkably fine opportunity for the study of glacial phenomena as exhibited upon steep slopes. There was no opportunity for detailed investigation of the igneous rocks of the volcano, but Mr. George Otis Smith made a small collection of specimens, upon which he has reported. On the northern slope granite was found at an elevation of 6,500 feet, which is about the altitude of the top of the Cascade Range on the east. There appears to be reason to believe that the mass of Mount Rainier up to this elevation is mainly granite or similar rocks of the older series, upon which the cone, 8,000 feet high, has been built up. Flows from Mount Rainier and from other vents in the vicinity entirely conceal the older rocks at lower levels.

This task completed, the remainder of Mr. Willis's time was devoted to the second subject of investigation—the areal survey of the Tacoma quadrangle. In this he was assisted by Mr. George Otis Smith. The area surveyed, embracing a portion of the Seattle quadrangle on the north and the included water bodies of Puget Sound, was 1,000 square miles in extent.

Among the prominent scientific results of the work, the development of a new hypothesis in regard to the origin of the present configuration of Puget Sound should be mentioned. Puget Sound has generally been regarded as representing a series of submerged valleys excavated by processes of erosion. It was suggested by Professor Russell that the channels of Puget Sound were residual hollows, from within which, or from under which, stagnant ice masses of the Glacial period had melted away, and that the plateaus of stratified and unstratified drift which lie between these channels were formed by deposits during the advance and retreat of various ice sheets. This suggestion was made at an early stage in the development of the work, and was confirmed by detailed observations of the distribution of various formations. It is not desirable in the present state of field material to elaborate the hypothesis, but it is believed that it will constitute a definite contribution to our knowledge of the processes of physiographic evolution.

The Tacoma quadrangle includes a number of working mines in coal beds of Eocene age. The investigation of these mines and of the sequence of the coal-bearing strata was pursued contemporaneously with the study of the drift problems, and it is believed that the material which was accumulated will permit the correlation, at least approximately, of the coal seams of different mines and the indication of their probable extensions. The structural geology of the coal-bearing rocks is particularly intricate, but the studies made and the data secured will doubtless lead to a much better understanding of the occurrence of the various coal basins. These results have both scientific and economic value. The area worked has been under investigation for coal for forty years, and it was therefore not to be expected that extensions of the known coal fields would be discovered. In one case, however, in a thickly settled region, the special knowledge of the drift phenomena possessed by the geologist in charge of the party enabled him to discover coal-bearing rocks near the surface, and to indicate the existence of a thickness of 4,000 feet of these strata where previous explorations had failed to find them. Only a small vein of coal was opened by the Geological Survey party in this extension of the field, but it is probable that more general prospecting will show the existence of valuable coal beds.

After returning from the field Mr. Willis was engaged chiefly in the discharge of supervisory and administrative duties. These were largely increased in February by his appointment as Assistant to the Director in Geology.

The field notes on the work in the Puget Sound district were elaborated by Mr. Smith, who compiled the data for the Tacoma atlas sheet and prepared an account of the glacial history of the Sound. These data are ready to be transferred to the Tacoma sheet.

The work of editing topographic and geologic maps, which was under Mr. Willis's charge, will be reviewed later (see pp. 120–125).

Spurr party (*Alaska*).—The reconnaissance of the gold district of the Yukon region in the interior of Alaska, begun in June and concluded in September, was undertaken in pursuance of a specific statutory provision. On February 3, 1897, a preliminary report on the work and its results was submitted, through the Department, to the United States Senate, in response to a resolution of that body. The full report, with accompanying maps, has now been completed, and will be published as one of the papers in Part III of this Annual Report.

The party, which consisted of Mr. J. Edward Spurr and two assistants, Messrs. H. B. Goodrich and F. C. Schrader, crossed the head waters of the Yukon by the Chilcoot Pass and proceeded down the river to Fortymile Creek. Reaching the district occupied by the gold-bearing formations, most of the available time was devoted to an examination of the auriferous rocks and gravels. All the creeks and gulches known to be productive were visited, although the reaching of some of these districts involved trips of hundreds of miles on foot. The area reconnoitered comprises upwards of 30,000 square miles. In the mining districts where actual production is going on somewhat careful areal work was done, and the territory thus covered is about 20,000 square miles in extent. The observations were carried down the Yukon as far as Nulato, where a river steamer conveyed the party to St. Michael. While at St. Michael an opportunity was found to make some interesting observations on the geology of that island, and similar observations were made on the islands of Unalaska and Unga.

In the course of this study and examination a belt of Paleozoic rocks, constituting the axis of a low range of mountains, was traced for several hundred miles. The formations in this belt were roughly differentiated, as were also the younger formations which lie upon the flanks of the older series. Carboniferous, Tertiary, and Pleistocene fossils were found in quantity. A large number of igneous rocks, both intrusive and effusive in origin, were collected for future study, and evidences of important orographic movements, involving physical and chemical changes in the rocks, were detected.

The placer gold of the Yukon and its tributaries was carefully studied, its location approximately determined, and some idea of its probable value gained. The source of the placer gold was traced to the solid-rock formations, and the nature and distribution of the rocks were for the first time ascertained. These rocks were followed in a definite belt for several hundred miles in Alaska, from the international boundary to the Lower Ramparts of the Yukon. In this belt the gold occurs in quartz veins and in impregnations along shear zones. It is chemically associated with pyrite. The ores appear to be of low grade and the quartz veins are usually nonpersistent.

Veins of argentiferous galena, or silver lead, were found in place in a number of localities in the Fortymile and Birch Creek districts. One assay of mixed galena and quartz shows 44 ounces of silver to the ton. Native silver in small fragments was also found in the gravels. Many of the ores contain a small amount of copper, as is shown by the green carbonate stains on the weather outcrops of the veins. Small fragments of native copper were found in the gravels at Mynook Creek.

Several coal-producing localities not previously known were visited. The best of the coal is of a hard, semibituminous variety, and much of it seems available as fuel. There is every indication that a large quantity will be found whenever systematic prospecting shall be undertaken. An area of these coal strata lies quite close to the gold-producing district.

On the return of the party to Washington, Mr. Spurr's first work was to provide for the systematic arrangement of the collections of rocks and fossils. The rocks included over 450 separate specimens from the interior of Alaska. The fossils, after being recorded, were turned over to the paleontologists of the Survey for determination. An extensive series of notes was then revised and a systematic catalogue made of information obtained from all sources. The sketch maps were taken in charge by Mr. Goodrich, and, with the Coast Survey chart of Alaska as a base, the field maps and notes were used to make a more complete map of the gold district. Several special maps of the chief mining districts were prepared on a more detailed plan from the surveys made by Mr. Spurr and his party.

After a study of the rock specimens collected, the paper on the Yukon gold field already mentioned was prepared, and some rough geologic reconnaissance maps were drawn to accompany it. Mr. Spurr also revised the manuscript for Monograph XXXI, on the Aspen district of Colorado, which he had somewhat hastily brought to a close before leaving for Alaska.

Becker.—In the plan of operations it was proposed that Dr. G. F. Becker should resume his work in California, but owing to his absence in South Africa during the summer, it was decided that he should complete his report upon the gold deposits of Alaska. He also prepared an article on the gold-bearing rocks of South Africa, which will be found in Part V of this Annual Report. The preparation of these papers, in connection with other office work, occupied his time during the remainder of the fiscal year. He was assisted by Mr. C. W. Purington.

THE GLACIATED REGIONS OF THE UNITED STATES.

Chamberlin party (Iowa, Missouri, Indiana, Illinois, Kentucky, and New York).—Prof. T. C. Chamberlin has general charge of the Pleistocene geology of the northern States within the glaciated belt. His work consisted mainly in directing the several investigations under his charge, and in visits to the field for consultation regarding obscure or critical problems. Under his direction Messrs. Frank Leverett, H. B. Kümmel, and W. C. Alden carried forward work in several areas.

Mr. Leverett's field work was devoted to a study of the drainage conditions that prevailed along the border of the Illinois glacial lobe at the time of its greatest extension, when it lay west of the Mississippi, on the eastern border of Iowa. The field work in September consisted of the study of the region adjoining the Mississippi Valley immediately south of this lobe, between Keokuk, Iowa, and Louisiana, Missouri.

The field work of October was devoted chiefly to the more definite correlation of the scattered drift ridges which occur in the southern part of the area once covered by the Illinois glacial lobe, in southwestern and southern Illinois, and to the drainage features of the portion of the Ohio Valley below Louisville, Kentucky, and the lower portion of the White River Valley, in Indiana. In connection with this, studies were made of the extent and character of the glacial deposits in southern Indiana and of the pre-Glacial gravels which cap some of the highest ridges of that region. Attention was also given to the water resources of southern Indiana, and data were collected from common and artesian wells and medicinal springs, which have been incorporated in Mr. Leverett's paper on the well waters of Ohio and Indiana, published in Part IV of this Annual Report. The closing days of October and the first days of November were spent in field consultation in central Illinois relative to the drainage conditions of the Shelbyville stage of glaciation and the relation of the white clay which covers southern Illinois to the Shelbyville drift sheet. The work in June was devoted to ascertaining more satisfactorily the relationship between the loess and the valley gravel deposits along the border of the Shelbyville and Bloomington moraines in west-central Illinois and to determining the border of the Iowan drift in northwestern Illinois.

The leading scientific results of Mr. Leverett's work were: First, the tracing of a river channel, supposed to be that of the glacial Mississippi, around the western edge of the Illinois ice lobe in eastern Iowa. Second, the discovery of this diversion of the Mississippi made it important to investigate the fillings and erosions of the Mississippi Valley above and below the point of diversion. A considerable amount of very significant data was collected bearing on these subjects. Third, a northward extension of the pre-Glacial gravels along the Ohio River into southern-central Indiana was determined, and the observation promises to have much importance in fixing dates of the successive stages of physiographic development of the Ohio Valley.

The studies of Mr. Leverett on the western border of the Shelbyville and Bloomington moraines have added new and conclusive evidence that the sheet of loess which mantles the drift lying outside the Shelbyville moraine passes under it; also that another mantle of loess, of much fresher character, overlies other parts of the Shelbyville moraine, as well as the still later Burlington moraine and the tract between them. Mr. Leverett also traced out more satisfactorily the obscure western border of the Iowan sheet of drift in northwestern Illinois. He collected many data bearing upon the soils of the areas examined and the relationship of these soils to the deposits from which they were derived. Additional evidence has been found that great agricultural differences arise from varying degrees of porosity of the several classes of glacial and glacio-fluvial deposits. This leads to the conviction that a classification of soils based upon their relation to the glacial agencies by which they were formed would be of fundamental importance to agriculture.

Prof. J. E. Todd made some supplementary observations on the drift of South Dakota for the purpose of complementing the data which he had previously gathered and putting the whole into form for publication as a bulletin of the Survey.

The work in northern Illinois consisted of the mapping of the Chicago and Calumet quadrangles by Mr. William C. Alden. The former, about 125 square miles in extent, he mapped in close detail, discriminating not only the different Paleozoic and glacial formations, but tracing out carefully the numerous beach lines and spits formed by the ancient lake. A similar survey was made of that part of the Calumet quadrangle which lies north of Calumet River, as far west as the Blue Island ridge, comprising about 61 square miles; making the total area mapped 186 square miles, and including 340 linear miles of geologic boundary lines. The detailed work in this region will be of great service from an educational standpoint, as it will afford an opportunity to students of various educational institutions of Chicago to study the development of the geographic features of northern Illinois.

Mr. Oscar H. Hershey was employed for a short time as a temporary field assistant in tracing out the western border of the Iowan drift sheet in the territory west of Rock River in the northwestern part of Illinois. He traced about 140 miles of geologic boundary, the larger portion of which is essentially new in detail.

Mr. Charles E. Peet was engaged between July 4 and September 6 upon the area covered by the New York quadrangle and its immediate vicinity. He mapped about 203 square miles, embracing 188 miles of geologic boundaries. In addition to the areal mapping, his observations embraced the special economic considerations that arise from the discovery and mapping of deposits of gravel and sand, which are in great demand in the metropolis for building and road materials; the outlining of the peat areas, the mapping of the accessible rocks, and the determination of the depth at which underlying rock may be reached in the construction of foundations, tunnels, etc.

Professor Chamberlin visited Iowa several times in company with one or more members of the Iowa State survey for the purpose of aiding in bringing about a more perfect coordination of the work of the two surveys and the use of common methods and a common nomenclature, and he reports a most cordial cooperation of the officers of the State survey in this endeavor.

During the year Mr. Leverett has prepared for publication and transmitted, through Professor Chamberlin, to the Hydrographic Division of the Survey, two elaborate papers, embracing data relative to the wells and sources of water supply in the States of Ohio and Indiana. The data have been collected chiefly under the supervision of Professor Chamberlin. To give greater intelligibility and utility to these, he has furnished a general description of the glacial formations in the States in question, upon which the shallow-water supplies depend. In response to a request from the Chicago Academy of Sciences, supported by the expressed desire of the schools of the city, Mr. Leverett prepared a general description of the surface features and the glacial and lacustrine deposits of Chicago and the adjoining region.

Gilbert party (region of the Great Lakes).—The problem assigned to Mr. G. K. Gilbert was the variation in relative height of land in the region of the Great Lakes and the associated history of the Niagara River. The question of the future of the Niagara has a definite economic bearing, and it is believed that the results of Mr. Gilbert's study will be of great general interest. The study being highly specialized and requiring examination of widely separated localities, as well as the traversing of extensive routes, does not admit of expression either in square miles of area or in linear miles of boundary.

The principal subject of investigation was the history of the Niagara River, past and future. With reference to the conditions determining the origin of the Niagara River, the tracing of the Warren shore line was continued in Michigan and New York, and the courses followed by the escaping water during the lowering of the water plane from the Warren level were traced across western New York. With reference to the variations in volume of the Niagara River, studies were made of the forms of the Niagara channel in its gorge, and search was continued for evidence of the temporary diversion of the discharge of the upper lakes to other channels, special attention being given to the physiography of the Detroit River and of the crest of the Niagara escarpment in western New York. With reference to variations in the base-level to which the Niagara has descended, search was continued for the course followed by the water of the Ontario basin after the Iroquois epoch, and the marine shore lines of the Champlain basin were traced westward in northern New York. With reference to the future history of the Niagara River, the question of the stability of the earth's crust in the region of the Laurentian lakes was investigated, and to this end a number of water-gauge stations were instituted at various points on the Great Lakes. The data thus acquired were compared with other data, chiefly observations of the United States Lake Survey, showing water levels in 1858, 1872, 1874, and 1876, with the result that a progressive tilting of the land in the Great Lakes region was demonstrated. The movement appears to be a differential uplift of a general nature, which has the effect of inclining the plane of the lake region toward the south-southwest. The rate is such that the difference in height of two points separated by 240 miles in a south-southwest direction undergoes a change of 1 foot in a century. Lakes Erie and Ontario and the southern parts of Lakes Michigan and Superior are encroaching on their shores; Lake Huron and the northern parts of Lakes Michigan and Superior are receding from their shores. This change is of economic importance at Chicago, because the land there is being submerged at the rate of about 9 inches a century. Eventually the outlet of all the lakes except Ontario will be shifted from the Niagara River to the Pleistocene channel at Chicago, and the discharge will become tributary to the Mississippi. The complete change will require several thousand years, but the overflow will begin in about five hundred years.

The lowest Warren shore line was traced for some distance in southeastern Michigan, so as to make connection with the work of others. The following facts were revealed: That all tributaries of the Detroit and St. Clair rivers flow in narrow post-Glacial channels, whose bottoms are considerably below the present river level, and it is hence inferred that the Detroit River, after opening its channel, temporarily ceased to flow; that a portion of the discharge from Lake Erie once crossed the Niagara escarpment at Lockport, and the volume of the Niagara River was thus temporarily diminished; that the water of the Ontario basin at the close of the Iroquois epoch descended for a time along a course beginning near Covey Hill and ending near West Chazy, New York; that the marine shores of the Champlain Valley extend westward through northern New York to the Ontario basin, being continuous with the so-called Oswego shore line previously recognized in that basin; and it follows that the Niagara River at one time discharged its waters to a gulf of the ocean.

During the spring of 1897 Mr. Gilbert discovered a delta containing the coarser part of the material moved in the formation of the Iroquois outlet channel from Rome to Schenectady. He also secured photographs of ancient waterways and deltas and types of drift topography.

In the office his time was largely taken up with the preparation of manuscript for the Pueblo (Colorado) folio. The geology of the Pueblo quadrangle was studied in 1893, but it was necessary to prepare a new topographic base map before the results could be prepared for publication. His office work also included the elaboration of notes on the Pleistocene history of the Niagara district, a revision of the proof of a catalogue of geologic bibliographies, the preparation of a paper on recent earth movements in the Great Lakes region, included in Part II of this Annual Report, and a variety of routine work.

Mr. Gilbert has had supervisory charge of investigations being made by Prof. William M. Davis, of Harvard University, Prof. J. M. Safford, of Nashville, Tennessee, and Dr. William Hallock, of Columbia University, New York. Professor Davis has completed a report on the Triassic formations of Connecticut, which appears in Part II of this Annual Report. Professor Safford is preparing a special report on the Wells Creek basin in Tennessee, which it is anticipated will be ready for publication during the ensuing year. Dr. Hallock took charge of the investigation of the deep well drilling near Pittsburg, Pennsylvania. He made a preliminary series of temperature measurements in January, 1897, which are in themselves of great value, and it is hoped that still more important results will be obtained by later work. The well was then more than a mile deep, and was to be carried to a considerably greater depth, so as to make it at least the deepest American boring. The investigation will be continued as the drilling of the well progresses.

FIELD AND OFFICE WORK BY THE DIRECTOR.

The field work of the Director consisted mainly in reconnaissance work in eastern California and western Nevada. Early in September, accompanied by Mr. F. B. Weeks, he proceeded to Silver Peak, Nevada, and made a somewhat thorough examination of the gold-bearing formations of the Red Mountain mining district, north-northwest of the town of Silver Peak. It was found that the gold-bearing quartzes occur in a siliceous, almost quartzitic, formation of Lower Cambrian age, and extend along the eastern slope of Mineral Ridge from 5 to 8 miles north of Silver Peak, the south end of Mineral Ridge being the site of the formerly very productive Silver Peak silver mines. As a result of this reconnaissance it is planned during the field season of 1897 to make a topographic survey of the region about Silver Peak, as a base for a detailed geologic map.

From Silver Peak a trip was made to Mount Magruder, through Fish Lake Valley, and thence back to Big Pine, and again over the Inyo Range, through Waucobi Canyon, to the head of Saline Valley. A short trip was also made down Owens Valley to Independence, and from there to the summit of the Inyo Range. It was found that the northern portion of that range is formed of Lower Cambrian rocks and the southern part of Triassic limestones and shales.

The return trip was made through southern California, a stop of several days being made at El Paso, Texas, for the purpose of examining the formations of the Franklin Range. A second stop was made in Indian Territory to examine the progress of the work of the land and topographic surveys under the charge of Mr. Fitch.

In the office a short paper was prepared on the comparatively recent elevation of the Inyo Range. A study of fossil Brachiopoda of the Cambrian formations was taken up from time to time, as odd hours could be spared from administrative duties and the consideration of the numerous questions that arise from day to day in the course of the general work of the Survey.

In connection with the legislation pertaining to forest reserves, considerable study was given to the general subject of the survey of the reserves and their proper care and administration.

After returning from the field Mr. Weeks continued the preparation of a bibliography of the literature pertaining to the Silurian formations of North America, and later took up and pushed to completion the 1896 number of his annual series of bibliographies of North American geology, which is now in press (Bulletin No. 149).

In the office work of the year the Director had the assistance of Dr. W. F. Morsell, stenographer and general assistant, and Miss Jean F. Kaighn, confidential clerk.

DIVISION OF PALEONTOLOGY.

As in the preceding year, several of the paleontologists were engaged in securing paleontologic evidence in the field to assist the geologists in the determination and correlation of the various geologic formations, for the purposes of mapping the distribution of the rocks and of determining their vertical range. The work of the paleontologist frequently borders so closely on that of the geologist as to render treatment under separate heads scarcely possible.

Special attention was given during the last season to the study and identification of faunas and floras pertaining to the coal regions of the Appalachians and the Rocky Mountains, and to the study of the Cretaceous fauna of Colorado, Utah, and Wyoming.

Girty party (*Paleozoic*).—Mr. George H. Girty spent two months studying certain Lower Carboniferous rocks of Ohio and making paleontologic collections, his field including the areas of Waverly strata of northern Ohio, in Cuyahoga, Summit, Medina, Geauga, and Lake counties, and Licking County in the central part of the State. The immediate purpose of the latter work was to secure material for a standard reference collection in the National Museum. The primary object of his study was, on the one hand, the correlation of the Carboniferous series of the southern Appalachians with that of Ohio, and, on the other, the determination of the equivalency of that of Ohio with the typical sections of the Mississippi Valley. None of the territory covered was new, for the "Waverly question" has long been a subject of dispute; but, in spite of the attention which it has received, many questions of importance still remain in doubt. The subject of the Lower Carboniferous faunas is a large one, and further field studies and collections are necessary before satisfactory correlations can be made. Wherever possible the paleontologic work was supplemented with stratigraphic observations and measurements, and, as occasion presented, specimens of flint, conglomerates, whetstones, fire clays, coals, etc., were collected. Mr. Girty also procured for Mr. David White, of the Survey, a good collection of Conostichus and Astrophycus, the former a rare and problematic organism, referred at present to the fucoids.

In the office Mr. Girty studied the collections made by him in the southern Appalachians and Ohio. Several small collections were identified for Mr. Weed and Mr. Vaughan, and the report on the Carboniferous fauna of the Yellowstone National Park was completed. Mr. Girty also gave considerable time to the study of collections and the supervision of drawings of Cambrian Brachiopoda for the Director.

Stanton-Knowlton party (*Cretaceous*).—The field work of Mr. T. W. Stanton was done in connection with that of Prof. F. H. Knowlton. In order to obtain data for comparison with those of other areas to be studied in greater detail, these specialists examined the typical exposures of the Arapahoe and Denver beds in the neighborhood of Golden, Green Mountain, and Sedalia, and extended their observations southward to Palmer Lake and Colorado Springs, in an unsuccessful endeavor to identify these formations south of the divide between the Arkansas and South Platte rivers. They then proceeded to Greeley, Colorado, and thence went to Crow Creek, where it had been suspected that Denver or Arapahoe beds might exist, but it was found that all the fossiliferous beds there are true Laramie.

The party next went to Lusk, Wyoming, and proceeded thence northward in Wyoming to the "Ceratops beds" on Lance Creek and its tributaries. In this area of about 150 square miles they spent nearly three weeks, studying and collecting from the section extending from the marine Cretaceous up through about 2,500 feet of brackish and fresh-water beds with a Laramie fauna and flora into strata yielding a Fort Union flora. The collections of fossil plants and invertebrates seem to confirm the principal results obtained from the study of the vertebrate fauna.

From the Coalville region the party visited in turn Carbon, Black Buttes, Point of Rocks, and Rock Springs, and from the last-named place went to Hams Fork and studied a section from the coal mines at Diamondville, which are in the Montana formation, up through several thousand feet of sediments to the

Laramie beds of Hodges Pass, which are probably the direct northern continuation of the Evanston coal-bearing series. On August 16 the section at the Almy coal mines, near Evanston, was examined, and here the work was virtually closed.

The principal results of this reconnaissance, scientific and economic, are: (1) the confirmation of the Laramie age of the Ceratops beds in Converse County, Wyoming; (2) the securing of additional and more conclusive evidence that there is a widespread coal-bearing horizon that must be included in the Fox Hills formation, and that the Laramie was in large part already established in that epoch; and (3) the collection of many fossils which will aid in making closer correlations of the beds in the different areas examined.

In the office Mr. Stanton studied and wrote out his field notes, and prepared, conjointly with Professor Knowlton, an article on the stratigraphy and paleontology of the Laramie and related formations in Wyoming. He then resumed a monographic study of the Lower Cretaceous fauna of the Texan region. The usual routine work of identifying and reporting on the collections of the Mesozoic fossils sent in by the field geologists and correspondents of the Survey and National Museum was kept up to date.

Professor Knowlton worked up the fossil plants collected on the expedition with Mr. Stanton, and wrote out his portion of the joint paper mentioned above. He then took up the preparation of, and nearly completed, a catalogue of the Cretaceous and Tertiary plants of North America, and studied and reported on the various collections of fossil plants sent to him by the geologists of the Survey, viz: Collections from the Yukon River, Alaska, made by Mr. Spurr and party; from southern Colorado, made by Mr. Cross; from the slope of Grizzly Peak, Oregon, made by Mr. Diller; from the Payette formation of Idaho, made by Mr. Lindgren; from the vicinity of Carbonado, Washington, made by Mr. Willis and assistants; and from the Richmond coal basin, Virginia, made by Professor Shaler. He also assisted Mr. Arthur Hollick in preparing for the press a monograph by the late Dr. J. S. Newberry on the later extinct floras of North America, and completed a memoir on the Montana formation and its flora.

Dall party (*Tertiary*).—Dr. W. H. Dall did no field work, being engaged in office and laboratory studies of material already in hand. His assistant, Mr. Burns, however, made a large and valuable collection of fossils from the Tertiary of Virginia, near Suffolk, that will fill a gap in the series of southern Tertiary material.

The office work has been of three kinds:

1. Registration and cataloguing of material. This has been kept up during a large part of the year, and Dr. Dall has the satisfaction of being able to report that the general collection of fossils is now completely registered—that is, each lot of fossils has received a number and an entry giving details of age, location, collector, etc. The names of the species in many cases are left for future determination, but during the year over 7,000 lots of fossils, comprising about 25,000 specimens, have been registered, and in future such work will be required only for material currently received.

2. Identification of material sent in by members of the Survey. In all cases when such identification was requested it has been made promptly, and there are no arrears of this kind. The total, number of collections received during the year is 110, containing several thousand specimens, all of which have been duly registered, with location and number, and cleaned and provisionally assorted.

3. Work of research. In the condition of the literature of the American Tertiary the first requisite is a revision of the nomenclature and classification of the described species and their assignment to definite horizons, so far as the data will permit. In previous years much has been done in the group of gastropods, which in its general features has been largely covered. During the last year similar work has been carried on for the pelecypods, more than half of which have been revised, and it is hoped that the remainder will be covered in the next six months, thereby putting the Tertiary fauna of our southeastern coast into a condition which will admit of rapid progress in its study and classification. The number of new and confused species proves very large. The definite separation from the typical Eocene of the group called Oligocene by

European writers is one of the results already attained. The division of the larger groups of the Tertiary into particular horizons will shortly be practicable, the divisions heretofore made, though many of them will stand, being based on very insufficient data.

A summary of the data relating to the subdivisions of the Tertiary as now understood has been prepared.

Ward party (*Paleobotany*).—Prof. Lester F. Ward continued field reconnaissance with a view to securing further data for a memoir upon the Lower Cretaceous floras, making a number of trips at different times to widely separated localities.

Early in the season, and also in the spring of 1897, several trips were made to points in Maryland and the District of Columbia. On August 13 he resumed the investigation of the northeastward extension of the Newer Potomac through Long Island and farther eastward. At Block Island three days were spent in making a circuit of the island and in investigating the rock exposures. An axis of Cretaceous strata was found that passes through the island from southwest to northeast.

About September 20, Professor Ward began work in the Great Plains region. After spending a few days in Kansas investigating some reported discoveries of cycadean remains, he went to Muskogee, Indian Territory, and thence proceeded in a northwesterly direction, his purpose being to cross the Carboniferous anticline and the Red Beds and to reach the Cretaceous outcrop southeast of Coldwater, Kansas. On October 2 Professor Ward was joined by Mr. T. W. Vaughan, and the two continued together for some time. The route followed is mentioned under the description of Mr. Vaughan's field work (p. 36). The work in Kansas consisted in studying the Cheyenne sandstone and its relations to the Red Beds below and the marine Cretaceous deposits above. The best exposures are in the vicinity of Belvidere. Fossil plants were obtained at three different horizons, showing corresponding changes in the flora. So far as they go they confirm Mr. R. T. Hill's conclusion that at least the upper part of the Cheyenne sandstone belongs to the Washita division of the Comanche series.

In April, 1897, Professor Ward visited South Carolina to study localities where fossil plants had been reported to occur. He found that the plants from one locality belong to the flora of the Newer Potomac formation, and those from other localities to a later flora (Eutaw).

In the office systematic work was continued, and such new matters were taken up as pertained to the general work of the Survey. At Professor Ward's request Professor Fontaine, of the University of Virginia, came to Washington for the purpose of determining the collection of fossil plants made by Professor Ward's party in 1895 in the vicinity of Oroville, California. The age of the bed yielding them could not be determined from stratigraphic data, and no other fossils occur in them than the plants, of which an exceedingly fine collection was made. Professor Fontaine, after having identified all the forms and described the new species, took ample notes for the preparation of a report on the subject. The exact horizon toward which the plants seem to point is near the base of the Jurassic, probably Lias. His report on the collection was submitted to Professor Ward, and is ready for publication as soon as the drawings can be made. In view of the fact that it fixes the age of the Oroville slates, which was hitherto unknown, it will constitute a very important chapter in the geology of California and of the United States, especially as it will be the first published account of the existence of fossil plants in the Jurassic formation anywhere in North America.

During the field season of 1896 a collection of plants was made by Mr. J. S. Diller's party (by Mr. Storrs) on Olalla Creek, Douglas County, Oregon, from beds which Mr. Diller thinks underlie the lower Cretaceous. These Professor Ward considered to be of Jurassic age, and he submitted them to Professor Fontaine for final determination. The latter reports that there is no doubt that the plants represent practically the same horizon as those from Oroville, California—that is, that they are Jurassic. Their final determination has been postponed, however, in the hope that a large collection may be made from the same locality during the present season.

Work was resumed on the correlation essay, which was so far brought up to date as to include all the facts relating to the flora of the lower Cretaceous. A systematic paper was prepared on the Maryland fossil cycads, and a beginning was made on a guide to the fossil floras of Washington and vicinity.

In the preparation of the compendium of paleobotany so many cases had been encountered for the settlement of which the necessary books could not be found in any of the libraries of Washington that Professor Ward's assistant, Miss Lottie Schmidt, was sent to Boston, Cambridge, and New York in search of these books. It was necessary for her not only to prepare bibliography cards of such books, but also to catalogue all the species they contain.

Marsh party (*Vertebrates*).—The field work of Prof. O. C. Marsh was limited to some personal examinations of the coast geology of New England. These included localities at Block Island, Marthas Vineyard, Staten Island, and on the Raritan River in New Jersey. The results of these studies have appeared in several articles published in scientific journals during the year.

In the office a reexamination was made of the questions of the origin and distribution of the edentate mammals, and Professor Marsh reports that the work on the monographs has gone on systematically.

Hyatt.—Prof. Alpheus Hyatt has devoted his entire time during the last year, except such as was spent in replying to questions from geologists in relation to the names and ages of fossils, etc., to the writing of a monograph on the Pseudoceratites of the Cretaceous. This group is one of the most important in the Cretaceous period for geologic work, and Professor Hyatt felt justified in making a complete monograph of all of its connected forms. This monograph is now nearly ready for the printer. During the spring, for the purpose of defining and studying the details of the species, Professor Hyatt visited and studied the originals and materials in the American Museum of Natural History at New York and the American Academy of Sciences at Philadelphia, and he received as loans for study, through correspondence, materials from all parts of the United States.

DIVISION OF CHEMISTRY.

During the fiscal year 1896-97 the work of the Division of Chemistry was continued under the charge of Prof. F. W. Clarke, who was assisted by Dr. W. F. Hillebrand, Dr. H. N. Stokes, and Mr. George Steiger, with some cooperation from Prof. Charles E. Munroe, of the Columbian University, Washington, D. C.

In the management of the exhibit of the General Government authorized by Congress, Professor Clarke was designated to act as the representative of the Department of the Interior at the Tennessee Centennial Exposition at Nashville, where he was engaged during the latter part of the year. In the early part of the year, and after May 1, he was largely occupied with various administrative duties and the compilation of the record of rock analyses that have been made by the chemical laboratory of the Survey. This material was brought together in a bulletin, which has been published as Bulletin No. 148 of the Survey series. In addition to the analyses, it contains a chapter by Dr. Hillebrand upon the methods which experience has led the chemists of the Survey to employ. There are 1,200 analyses, systematically arranged, and each one, so far as was practicable, is prefaced by a statement of the petrographic character of the rock and a reference to the publication in which it appeared earlier.

The routine work of the Division of Chemistry has been along the usual lines. In all, 326 analyses have been reported as finished. These have covered the ordinary range of rocks, minerals, coals, ores, waters, etc. Among the larger series of analyses may be named a group of 17 minerals and rocks from Butte, Montana; 18 rocks from Mount Ascutney, Vermont; 12 from Texas, and 10 from Crater Lake, Oregon.

On account of the great demand upon the laboratory for analyses, little original research has been attempted. One investigation, however, has been started which promises to be of considerable importance and interest in the future. The subject was the supposedly well-known chloronitride of phosphorus, from which Dr. Stokes has developed a unique series of polymers, each yielding its own peculiar derivatives. This appears to open up a new field in inorganic chemistry from which a rich harvest of results can be obtained.

DIVISION OF HYDROGRAPHY.

This division was continued in charge of Mr. Frederick H. Newell, whose assistants were Messrs. Arthur P. Davis, Willard D. Johnson, Cyrus C. Babb, and Edwin G. Paul. In addition there have been employed a considerable number of specialists, whose names are mentioned below in connection with the work carried on in various localities.

During the last year the work of this division has continued to expand under the opportunities offered by a larger appropriation. Field work has been carried on in a manner similar to that of preceding years, but more streams have been measured and a broader area has been covered by the investigation of underground waters and artesian wells. In its administrative features the work done is divided into three parts, namely: the measurement of surface streams, the study of underground waters, and the preparation of reports upon the best methods of utilizing the water resources of the country.

In apportioning the funds available to the different classes of work, the measurement of surface streams received the greater part, nearly one-half of the appropriation being expended for this purpose. In connection with these measurements occasional examinations have been made of reservoir sites in order to furnish facts for the determination of the possible supply under conditions of storage. The results of the operations are shown in the report of progress of stream measurements, prepared by Mr. Arthur P. Davis and published as the first paper in Part IV of this Annual Report. To the second class of work, the investigation of underground currents and artesian wells, about one-fourth of the available funds has been devoted, the results of field work being shown in a number of papers, two of which, those by Messrs. Frank Leverett and N. H. Darton, are also given in Part IV. To the third class of work, the preparation of reports upon methods of utilizing the water supply, the remainder of the allotment has been devoted, and it has been utilized in special investigations on various lines, from considerations of water power in the East to methods of applying water to the soil in the West. The results are shown in greater detail under a later heading (p. 81).

The following description of field work carried on in various parts of the country is arranged in a general geographic order. First comes the humid region, including the eastern half of the country, or the States lying to the east of about the ninety-seventh meridian; next the subhumid region, which includes the States taken in order from North Dakota to Texas; and, finally, the arid region, under which heading are included the remaining States with the two Territories of Arizona and New Mexico.

HUMID REGION.

New England.—The hydrographic data for the rivers of New England have been brought together by Prof. Dwight Porter, who has prepared a report upon the water powers of this region and discussed the figures obtainable regarding the river flow. This material forms the basis for systematic examinations of the variations in discharge of some of the more important streams of the region.

New York.—Facts regarding the water power of New York have been obtained by Mr. George W. Rafter, these being procured in connection with his investigations for the State engineer and surveyor, which have been supplemented by later research. Most of these figures have been obtained through the proprietors of water-power plants, and are based upon weir computations of overflow dams or on estimates of the capacities of water wheels.

Pennsylvania and Maryland.— Systematic measurements have been gradually extended northerly from the Potomac into these States. A station has been located on the Susquehanna River at Harrisburg, and observations are being carried on at points on Octoraro Creek, Monocacy, Patapsco, and Patuxent rivers, and Antietam Creek, as well as at points in Maryland on the Potomac. The work in the latter State is done in cooperation with Prof. W. B. Clark, State geologist.

Virginia and West Virginia.—Measurements of the Potomac River and its tributaries, and also of some of the streams forming part of the Ohio drainage, have been continued under the supervision of Prof. D. C. Humphreys, of Lexington, Virginia. In connection with the systematic work, he has continued at intervals a general reconnaissance of localities where water powers may be developed.

North and South Carolina.—In cooperation with Prof. J. A. Holmes, State geologist, the river stations have been maintained in these States and the number has been slightly increased. The field work has been carried on mainly by his assistant, Mr. E. W. Myers.

Georgia, Alabama, and Tennessee.—The operations in Georgia, under the direction of Prof. B. M. Hall, of Atlanta, have been gradually extended to streams rising in the southern end of the Appalachian area and flowing southerly through Alabama and westerly into Tennessee. The operations in Alabama have been carried on in cooperation with Prof. Eugene A. Smith, State geologist, who has also collected data concerning the waters obtained by wells.

Ohio, Indiana, and Illinois.—The hydrographic data obtained by Mr. Frank Leverett in his glacial studies extending across Ohio and Indiana have been compiled by him, and rounded out by later observations. These facts pertain mainly to the well waters of those States. The results are published in his paper in Part IV of this Annual Report. He has also continued the compilation of data regarding the wells of Illinois, this material being supplementary to that contained in his paper published in the Seventeenth Annual Report, Part II. In addition, Prof. Edward Orton, State geologist of Ohio, has brought together a considerable body of facts relating to the water resources from the deeper wells of that State, obtained in part in connection with his investigations of the occurrence of oil and gas.

Michigan.—Prof. Alfred C. Lane, assistant State geologist, has begun, through correspondence by schedules, the collection of facts concerning well waters, with the intention of supplementing this information by occasional field work.

Mississippi Valley.—In the remaining States of the Mississippi Valley lying east of the ninety-seventh meridian no field work has been attempted, although requests for information have been made, especially from persons on the lowlands, where shallow well waters are not suitable for drinking purposes. It is desirable to bring together facts concerning the feasibility of sinking deep wells in these localities, but during the last year it has not been considered advisable to undertake this work.

SUBHUMID REGION.

The subhumid region is, for convenience, regarded as including the greater parts of the States of North and South Dakota, Nebraska, Kansas, Texas, and the Territory of Oklahoma. The principal work carried on in these States has been in connection with artesian investigations, although a considerable number of stream measurements have also been made.

North Dakota.—In this State Prof. Earle J. Babcock, of Grand Forks, has made a reconnaissance of the area in the vicinity of Devils Lake and to the north. The results of his work have been prepared for publication as one of the series of Water-Supply and Irrigation Papers.

South Dakota.—Mr. N. H. Darton, assistant geologist, has conducted some field work in this State, being assisted by Maj. Fred F. B. Coffin. His conclusions are embodied in a paper which appears in Part IV of this Annual Report, and which is in a sense a continuation of his paper in the Seventeenth Annual Report.

Nebraska.—The largest single investigation undertaken during the year has been the systematic work of Mr. Darton in his thorough examination of the country from the vicinity of Lincoln westward along the Platte Valley to the neighborhood of Lexington. In this work he was assisted by the late Mr. Joseph Macfarland, whose death at the end of the field season deprived the Survey of one of its most energetic and promising younger investigators. The conclusions reached by Mr. Darton have been embodied in a paper to be published as No. 12 of the series of Water-Supply and Irrigation Papers.

Prof. Erwin H. Barbour, acting State geologist, has cooperated in a general study of the well waters of the State, and has prepared a paper on the utilization of these, especially through the employment of windmills in bringing the water to the surface.

The river measurements in this State have been carried on under the direction of Prof. O. V. P. Stout, with the exception of the measurements at North Platte, which have been in charge of Mr. Charles P. Ross.

Kansas.—Prof. Erasmus Haworth, of the Kansas University geological survey, has prepared for this division a report upon the water conditions of the area south of the Arkansas River, in the vicinity of Dodge and Garden. This has been published as No. 6 of the Water-Supply and Irrigation Papers. Mr. Willard D. Johnson, hydrographer of this Survey, has spent the greater part of the year in western Kansas working with various investigators and bringing together information regarding the behavior of water underground.

Prof. E. C. Murphy, of Lawrence, has conducted a series of experiments on the efficiency of windmills in raising water for irrigation, taking the mills in actual operation in the vicinity of Garden, and has prepared for publication as Paper No. 8 a description of his tests. A similar line of investigation has been carried on by Prof. O. P. Hood, at Manhattan, upon the efficiency of various pumps, such as are commonly employed in raising water for irrigation.

The stream measurements of the western part of the State have been under the charge of Mr. W. G. Russell, while those in the eastern part, in the vicinity of Lawrence, have been carried on by Prof. E. C. Murphy.

Texas.—A report on the utilization of water in irrigation in portions of Texas has been prepared, under the direction of Prof. J. H. Connell, of Bryan, by Mr. William Ferguson Hutson. A special investigation has also been made by Prof. Thomas U. Taylor, of Austin, on the rate of silting of Lake McDonald, data of this character being of great importance in estimates of available water from storage projects. The paper by Messrs. R. T. Hill and T. W. Vaughan, on the geology of portions of the Edwards Plateau and Rio Grande Plain adjacent to San Antonio, with special reference to the occurrence of artesian and other underground waters, has been completed and appears in Part II of this Annual Report. A few additional stream measurements have also been made by Mr. Cyrus C. Babb.

ARID REGION.

In discussing the hydrographic work of the arid region, the alphabetic instead of the geographic order is adopted, as being more convenient for general reference. The principal work here has been the maintenance of measurements of the discharge of streams rising in the high mountains and flowing out upon the valleys. The results of these measurements have been discussed in a number of papers in connection with the utilization of the waters in irrigation, the details being given in the paper by Mr. Davis in Part IV of this Annual Report.

Arizona—In this Territory observations have been continued at the Buttes, above Florence, to ascertain the amount of water which might be held by a suitable storage reservoir at that point; and computations of discharge have been made for the Verde and Salt rivers near their junction.

California.—The river measurements in this State have been continued by Mr. J. B. Lippincott, who has also prepared a paper on the water supply of the San Bernardino Valley. Mr. C. E. Grunsky, of San Francisco, has written a report upon irrigation in the southern or upper end of the San Joaquin Valley, and has brought together material for a description of the area farther north. Mr. James D. Schuyler, of Los Angeles, has prepared a thoroughly illustrated discussion of the principal storage dams and reservoirs constructed for the purpose of irrigation. and this appears as one of the papers in Part IV of this Annual Report.

Colorado.—The State engineer of Colorado has continued to cooperate in the measurement of the discharge of rivers of this State, assistance being given by Mr. F. Cogswell, deputy State engineer. Mr. David Boyd, of Greeley, has prepared a paper on the development of irrigation near Greeley and the Colorado system of legislation, founded largely on the experience of Union Colony. This paper has been published as No. 9 of the Water-Supply and Irrigation series.

Idaho.—Mr. F. J. Mills, State engineer of Idaho, has been of assistance in continuing the river measurements in this State, the work being carried on during the past year mainly by Mr. Grant H. Nickerson; and data regarding Bruneau River have been obtained from Mr. Andrew J. Wiley, of Grandview.

Montana.—The river stations in this State have been maintained by Prof. Frank Beach, of Bozeman, assisted by Mr. Roe Emery, these being mainly in or adjacent to the Gallatin Valley.

Nevada.—Mr L. H. Taylor, of Battle Mountain, has continued the field work in this State at various points along the Humboldt River and on its tributary, Rock Creek.

New Mexico.—The work at various places along the Rio Grande has been continued under the charge of Mr. P. E. Harroun, except at El Paso, where, by request of Gen. Anson Mills, the station has been placed in charge of Mr. W. W. Follett, civil engineer for the Mexican Boundary Commission.

Oregon.—The river stations in the eastern portion of this State have been in charge of Mr. Grant H. Nickerson, the work being done in connection with that in Idaho. In the northeastern part of the State the river measurements have been made by Mr. Cyrus C. Babb.

Utah.—Prof. Samuel Fortier, of Logan, has continued work at the river stations, with the assistance of Mr. William Dougall, and also has conducted seepage measurements, being aided in the latter by county authorities and others, as the results are of immediate practical benefit to the inhabitants of the northern part of the State. The results of this latter work are given in Paper No. 7 of the Water-Supply and Irrigation series.

Washington.—Mr. Cyrus C. Babb, assistant hydrographer, has devoted a considerable part of his time to stream measurements in this State, having also inspected the operations of resident hydrographers in other localities. The attempt is being made to place this work in charge of some person conveniently located.

Wyoming.—Prof. Elwood Mead, State engineer, has continued to render assistance to the Survey, the work of stream measurement being carried on by his assistant, Mr. C. T. Johnson. Aid has also been rendered by Mr. Edward Gillette, at Sheridan.

LIST OF RIVERS MEASURED.

The following list gives, in geographic order by drainage basins, the localities at which systematic measurements or computations of discharge have been made. At most of these the work has been done by hydrographers of the Survey, while at a few the data have been obtained from engineers, being rounded out by additional measurements or by computation.

List of rivers measured in 1896–97.

River.	State.
Chesapeake watershed:	
Susquehanna River at Harrisburg	Pennsylvania.
Octoraro Creek at Rowlandville	Maryland.
Patapsco River at Woodstock	Do.
Patuxent River at Laurel	Do.
Potomac basin:	
South Branch of Potomac River at Springfield	West Virginia.
Potomac River at Cumberland	Maryland.
Antietam River at Sharpsburg	Do.
North River at Port Republic	Virginia.
South River at Port Republic	Do.
Shenandoah River at Millville	West Virginia.
Potomac River at Point of Rocks	Maryland.
Monocacy River at Frederick	Do.
James River basin:	
North Fork of James River at Glasgow	Virginia.
James River at Buchanan	Do.
South Atlantic watershed:	
Roanoke River at Roanoke	Virginia.
Dan River at Clarksville	Do.
Staunton River at Clarksville	Do.
Roanoke River at Neal	North Carolina.
Tar River at Tarboro	Do.
Neuse River at Selma	Do.

List of rivers measured in 1896-97—Continued.

River.	State.
South Atlantic watershed—Continued.	
Cape Fear River at Fayetteville	North Carolina.
Yadkin River at Salisbury	Do.
Yadkin River at Norwood	Do.
Catawba River at Rock Hill	South Carolina.
Catawba River at Catawba	Do.
Broad River at Gaffney	Do.
Broad River at Alston	Do.
Saluda River at Waterloo	Do.
Savannah River at Calhoun Falls	Do.
Oconee River at Carey	Georgia.
Ocmulgee River at Macon	Do.
Gulf of Mexico watershed:	
Chattahoochee River at Oakdale	Georgia.
Chattahoochee River at West Point	Do.
Etowah River at Canton	Do.
Coosawattee River at Carters	Do.
Oostanaula River at Resaca	Do.
Coosa River at Riverside	Alabama.
Coosa River at Lock No. 5	Do.
Black Warrior River at Tuscaloosa	Do.
Ohio River tributaries:	
Greenbrier River at Alderson	West Virginia.
New River at Fayette	Do.
French Broad River at Asheville	North Carolina.
Tuckasegee River at Bryson	Do.
Little Tennessee River at Judson	Do.
Hiwassee River at Murphy	Do.
Upper Missouri basin:	
Missouri River at Townsend	Montana.
West Gallatin River at Salesville	Do.
Middle Creek at Bozeman	Do.
Gallatin River at Logan	Do.
Madison River at Redbluff	Do.
Jefferson River at Sappington	Do.
Yellowstone River at Livingston	Do.
Shoshone River at Lovell	Wyoming.
Grey Bull River at Meeteetse	Do.
Little Goose Creek at Sheridan	Do.
Big Goose Creek at Sheridan	Do.
Clear Creek at Buffalo	Do.

List of rivers measured in 1896-97—Continued.

River.	State.
Platte basin:	
Laramie River at Woods Landing	Wyoming.
Laramie River at Uva	Do.
North Platte River at Orin Junction	Do.
North Platte River at Camp Clarke	Nebraska.
North Platte River at North Platte	Do.
South Platte River at Deansbury	Colorado.
South Platte River at Denver	Do.
South Platte River at Orchard	Do.
North Loup River at St. Paul	Do.
Middle Loup River at St. Paul	Do.
Loup River at Columbus	Do.
Platte River at Columbus	Do.
Elkhorn River at Norfolk	Do.
Kansas basin:	
North Fork Republican River at Haigler	Nebraska.
Frenchman River at Wauneta	Do.
Frenchman River at Palisade	Do.
Republican River at Superior	Do.
Republican River at Junction City	Kansas.
Solomon River at Beloit and Niles	Do.
Saline River at Beverly and Salina	Do.
Smoky Hill River at Ellsworth	Do.
Blue River at Manhattan	Do.
Kansas River at Lawrence	Do.
Arkansas basin:	
Arkansas River at Granite	Colorado.
Arkansas River at Salida	Do.
Arkansas River at Canyon	Do.
Arkansas River at Pueblo	Do.
Purgatoire River at Trinidad	Do.
Arkansas River at Hutchinson	Kansas.
Verdegris River at Liberty	Do.
Neosho River at Iola	Do.
Rio Grande basin:	
Rio Grande at Del Norte	Colorado.
Rio Grande at Embudo	New Mexico.
Chama River at Abiquiu	Do.
Rio Grande at Rio Grande	Do.
Rio Grande at San Marcial	Do.
Rio Grande at El Paso	Texas.

List of rivers measured in 1896–97—Continued.

River.	State.
Colorado basin:	
Grand River at Grand Junction	Colorado.
Dolores River at Dolores	Do.
San Miguel River at Fall Creek	Do.
Uncompahgre River at Fort Crawford	Do.
Blacks Fork River at Granger	Wyoming.
Green River at Green River	Do.
Green River at Blake	Utah.
San Juan River at Arboles	Colorado.
Piedras River at Arboles	Do.
Animas River at Durango	Do.
Gila River at Buttes	Arizona.
Salt River at Mount McDowell	Do.
Verde River at Mount McDowell	Do.
Interior basin in Nevada:	
Humboldt River at Elko	Nevada.
Humboldt River at Battle Mountain	Do.
Humboldt River at Golconda	Do.
Humboldt River at Oreana	Do.
Rock Creek at Battle Mountain	Do.
South Fork of Humboldt River at Mason's Ranch	Do.
Interior basin in Utah and Idaho:	
Logan River at Logan	Utah.
Bear River at Collinston	Do.
Ogden River at Eden	Do.
Weber River at Uinta	Do.
Provo River at Provo	Do.
Utah Lake, at Geneva	Do.
Columbia basin:	
Snake River at Montgomery Ferry	Idaho.
Malad River at Taponis	Do.
Little Wood River at Taponis	Do.
Bruneau River at Grand View	Do.
Boise River at Boise	Do.
Owyhee River at Nyssa	Oregon.
Malheur River at Vale	Do.
Payette River at Payette	Idaho.
Weiser River at Weiser	Do.
Yakima River at Selah	Washington.
Yakima River at Union Gap	Do.

List of rivers measured in 1896-97—Continued.

River.	State.
Columbia basin—Continued.	
Yakima River at Kiona	Do.
Spokane River at Spokane	Do.
Umatilla River at Gibbon	Oregon.
San Francisco Bay drainage:	
Sacramento River at Redbluff	California.
Sacramento River at Jellys Ferry	Do.
Stanislaus River at Oakdale	Do.
Tuolumne River at La Grange	Do.
Tuolumne River at Modesto	Do.
San Joaquin River at Herndon	Do.
Kings River at Red Mountain	Do
Kings River at Kingsburg	Do.
Kern River near Bakersfield	Do.
Lost creeks in southern California:	
Little Rock Creek at Palmdale	California.
San Gabriel River at Azusa	Do.
Santa Ana River at Warm Springs	Do.

REPORTS.

The results of the operations during the last year are partly shown in Part IV of this Annual Report, which is devoted to hydrography. These papers have been referred to in the preceding account of work at various localities. In addition, the Division of Hydrography now has a separate series of publications, referred to on preceding pages, entitled Water-Supply and Irrigation Papers. Of these about twenty-five have been prepared from the operations of the year. Six have been printed, and others are in the hands of the printer or are practically ready to be forwarded to him. The following list gives the titles of these papers, the order after No. 13 not having yet been determined:

Water-Supply and Irrigation Papers.

1. Pumping water for irrigation, by Herbert M. Wilson, 1896.
2. Irrigation near Phœnix, Arizona, by Arthur P. Davis, 1897.
3. Sewage irrigation, by George W. Rafter, 1897.
4. A reconnaissance in southeastern Washington, by Israel C. Russell, 1897.
5. Irrigation practice on the Great Plains, by E. B. Cowgill, 1897.
6. Underground waters of southwestern Kansas, by Erasmus Haworth, 1897.
7. Seepage waters of northern Utah, by Samuel Fortier.
8. Windmills for irrigation, by E. C. Murphy.
9. Irrigation near Greeley, Colorado, by David Boyd.
10. Irrigation in Mesilla Valley, by F. C. Barker.
11. River heights for 1896, by Arthur P. Davis.
12. Water resources of southeastern Nebraska, by Nelson H. Darton.
13. Water resources of the Devils Lake region, North Dakota, by Earle J. Babcock.

Irrigation in the upper portion of San Joaquin Valley, by C. E. Grunsky.
Irrigation in San Bernardino Valley, by J. B. Lippincott.
Well waters of Nebraska, by Erwin H. Barbour.
Sewage irrigation in the United States, by George W. Rafter.
Wells of Indiana, by Frank Leverett.
Ground waters and irrigation, by F. H. King.
Deep wells of Ohio, by Edward Orton.
Water powers of New England, by Dwight Porter.
Efficiency of pumps in irrigation, by O. P. Hood.
Water power of New York, by George W. Rafter.
Average discharge of rivers, by F. H. Newell.
Overflow of Arkansas Valley, by Willard D. Johnson.

DIVISION OF MINERAL RESOURCES.

The work of the Division of Mineral Resources, under the charge of Dr. David T. Day, consisted mainly, during the fiscal year just closed, of the correspondence necessary to the gathering and compilation of the statistical data for the calendar year 1896 and of the preparation of a report embodying those data, which is published as Part V of this Annual Report. Considerable time was also given to the preparation of replies to many demands for technical information in regard to the conditions of occurrence and the uses of the various minerals found in the United States.

In addition to the various special agents who have aided in this work, Dr. Day has been assisted by Mr. E. W. Parker, statistician; Mr. W. A. Raborg, assistant geologist; Mr. Jefferson Middleton, clerk; and Messrs. Theodore H. Johnson and Griffith Thornton and Misses J. M. Corse, A. T. Coons, and A. Gerry, statistical experts.

Instead of a normal increase of at least $25,000,000, the mineral product of 1896 showed only a slight increase in its total value, from $622,628,685 in 1895 to $623,717,288 in 1896. There were nine substances of which the product was not only increased but for which the value was the greatest ever attained. Among these the important ones are gold, copper, aluminum, and petroleum. On the other hand, the product of many substances was increased in amount, but the value was less than that of the smaller product yielded the year before. This includes such important substances as lead, bituminous coal, building stones, mineral waters, salt, and pyrite.

The principal factors in this total are given in detail below.

METALS.

Iron and steel.—During the whole of the year 1896 there was a serious reaction from the activity of 1895 in all branches of the iron and steel industries of the United States, except in open-hearth steel. The production of pig iron in 1896 decreased 823,181 tons as compared with 1895, or 8.7 per cent; spiegeleisen and ferromanganese, 39,784 tons, or 23.1 per cent; Bessemer steel ingots, 989,222 tons, or 20.1 per cent; open-hearth steel increased 161,518 tons, or 14.2 per cent; all kinds of steel decreased 833,145 tons, or 13.6 per cent; structural shapes, 22,349 tons, or 4.3 per cent; plates and sheets, 25,683 tons, or 2.5 per cent; Bessemer steel rails, 182,670 tons, or over 14 per cent; wire rods, 167,144 tons, or 21.1 per cent; all rolled iron and steel, including rails, 673,733 tons, or 10.8 per cent; iron and steel cut nails, 514,024 kegs, or 24.1 per cent; iron and steel wire nails, 1,121,543 kegs, or 19.1 per cent. Included in the production of all kinds of rails in 1896 were 145,210 tons of street and electric rails, against a production in 1895 of 163,109 tons, showing a decrease in 1896 of 17,899 tons. In 1896 the United States made 8,623,127 tons of pig iron, 3,919,906 tons of Bessemer steel ingots, 1,298,700 tons of open-hearth steel, and 5,281,689 tons of steel of all kinds, and rolled in all 5,515,841 tons of finished iron and steel, including rails.

The total value of all kinds of steel produced in the United States in 1896 was $105,565,000, as compared with $117,500,000 in 1895. Of this total, $31,300,000 was for steel rails and $74,265,000 for all other partly finished forms.

Gold.—The product of gold was valued at $53,088,000. This is not only the greatest product of gold ever obtained in the United States, but it was a percentage gain of 12⅕ over 1895 and more than 25½ over 1894. The product from 1880 to 1892 fluctuated only slightly, between thirty and thirty-three million dollars; but in 1893 the rise began and has continued with no prospect of a decline. The increase from $46,610,000 in 1895 to $53,088,000 in 1896 has been due to the further development of the unusually productive regions of Crippel Creek, Colorado; Mercur, Utah; and the Deadwood district in South Dakota.

Silver.—The coining value of the silver product in 1896 was $76,069,236, or a commercial value of $39,655,000. This is an increase of $4,018,236 over 1895, and of more than $12,000,000 over the product of 1894.

Copper.—The industry is in a flourishing condition. The product aggregated 460,061,430 pounds, or 205,384 long tons, valued at $49,456,603—the greatest product ever obtained in the United States, and greater than the gold product in any year prior to 1896. In addition the copper obtained from imported pyrites amounted to 5,900,000 pounds; from other imports, to 11,496,933 pounds. The exports amounted to 281,355,221 pounds, or 58.93 per cent of the total supply.

Lead.—The value showed a decline, with a gain in total quantity. In 1896, 188,000 short tons of lead were produced, worth $10,528,000. In 1895 the product was 170,000 tons, worth $11,220,000.

Zinc.—This metal also shows a decline in quantity from 89,686 to 81,499 short tons, but a gain in the value of the product from $6,278,020 in 1895 to $6,519,920 in 1896.

Quicksilver.—In 1881 the product was 60,851 flasks (4,655,101 pounds, or 2,328 short tons), but ten years later production had fallen to about one-third of this. Since then the product has gained slowly to 36,104 flasks in 1895, valued at $1,337,131. In 1896 the product declined, but not significantly, to 30,765 flasks, worth $1,075,449. The industry is still practically confined to California, but is slowly extending into Oregon. No development has been made of the deposit recently found in Texas.

Aluminum.—The product of aluminum and the variety of its uses continue to increase. In 1895, 920,000 pounds were produced, and this increased to 1,300,000 pounds in 1896. Meanwhile, with more efficient work in producing and cheaper cost of power, the price has declined, so that the total value of $464,600 in 1895 increased to only $520,000 in 1896.

Antimony.—The product increased to 601 short tons in 1896, worth $84,290, from 450 tons in 1895, worth $68,000.

Nickel.—The United States still contributes a small by-product, which amounted to 17,170 pounds in 1896, worth $4,464. In 1895 the product was 10,302 pounds, valued at $3,091. The Canadian mines still furnish the principal supply.

Manganese.—The product showed a slight increase, from 9,547 long tons in 1895, worth $71,769, to 10,088 tons in 1896, valued at $90,927. The sources remained the same, but the imports increased.

Platinum.—Product, 163 ounces; worth, crude, $944; all from the Pacific Coast.

FUELS.

Coal.—The total amount of coal of all kinds produced in 1896 was 171,416,390 long tons, equivalent to 191,986,357 short tons, against 172,426,366 long tons, or 193,117,530 short tons, in 1895, a decrease of 1,009,976 long tons, or 1,131,173 short tons, or about three-fifths of 1 per cent. The production in 1896 included 48,523,287 long tons, or 54,346,081 short tons, of Pennsylvania anthracite, against 51,785,122 long tons in 1895 and 46,358,144 long tons in 1894. The value of the anthracite product in 1896 was $81,748,651; in 1895, $82,019,272, and in 1894, $78,488,063. The bituminous product in 1896 was 122,893,104 long tons, or 137,640,276 short tons, valued at $114,891,515. The bituminous product in 1895 was 120,641,244 long tons, equivalent to 135,118,193 short tons, valued at $115,779,771, and in 1894, 106,089,647 long tons, or 118,820,405 short tons, valued at $107,653,501.

The product of bituminous coal includes a small amount of anthracite coal mined in Colorado and New Mexico, also semianthracite mined in Arkansas and Virginia, lignite coals mined in Colorado, North Dakota, Texas, and on the Pacific slope, and semibituminous, cannel, and block coals.

As in 1895, the production of coal, particularly in the bituminous fields, was much larger than the market could profitably absorb, and the year was marked by low prices and little, if any, profit to the operators. While the production of bituminous coal in 1896 was more than 2,500,000 tons in excess of that of the preceding year, the value fell off nearly $900,000. The average price obtained for anthracite coal marketed in 1896 was $1.85 per long ton, against $1.72 in 1895. The increase in price in anthracite during 1896 was not due to any increased demand for coal, but to the fact that the anthracite coal operators' association was stronger than in the preceding year and was able to maintain prices upon a basis more satisfactory to itself. In arriving at the average price of anthracite coal, only the amount of coal marketed is considered. The amount consumed at the collieries is not taken into consideration, for the reason that this consists of culm or slack, which would otherwise be thrown on the dump or wasted. The average price per ton for bituminous coal in 1896, obtained by dividing the total value by the total product, was $0.83, which shows a decline of 3 cents, from $0.86 in 1895. As in the preceding year, the decline in value was general throughout the United States.

Coke.—The total product of coke in the United States in 1896 was 11,788,773 short tons, as compared with 13,333,714 in 1895 and 9,203,632 in 1894. The output of coke in 1895 was the largest ever obtained, while the product in 1894 was the smallest since 1889. While the output in 1896 was less by 1,544,941 tons than in 1895, it was larger than in any previous year except 1892, and about 900,000 short tons larger than the average product for the seven years from 1889 to 1895, inclusive.

An interesting feature of the coke industry in 1896 was the increase in value, for, while the product was less than in 1895, the value increased $2,426,410. The average price per ton realized increased from $1.44 in 1895 to $1.837 in 1896. The increase in price and the decrease in production were entirely due to the higher prices set by the larger producers of Connellsville coke. The large concerns in the Connellsville region put the price of their product early in 1896 at $2 per ton for furnace, $2.30 for foundry, and $2.35 for crushed, maintaining these prices throughout the year at the expense of a decrease of 2,718,689 tons in the amount of coke made.

Petroleum.—The product increased from 52,892,276 barrels (of 42 gallons each) in 1895 to 60,960,361 barrels in 1896, while, owing to a decline in price in 1896, the total value for the larger product in 1896, $58,518,709, was only $886,413 more than that of the smaller product of 1895, i. e., $57,632,296.

Natural gas.—This product declined again, but only slightly, i. e., from $13,006,650 in 1895 to $13,002,512 in 1896.

STRUCTURAL MATERIALS.

Stone.—The total value of stone of all kinds declined from $34,688,816 in 1895 to $31,346,171 in 1896. The principal features of the year were the considerable increase of the exports of slate, on account of the strikes in Wales, and the increased amount of marble used for exterior building.

Soapstone.—Product, 22,183 short tons, worth $354,065, compared with 21,495 tons, worth $266,495, in 1895. The difference in the value is due to difference in the class of manufactured articles for which part of the soapstone was prepared before it left the quarries. The product of fibrous talc increased from 39,240 short tons, worth $370,897, in 1895 to 46,089 short tons, worth $399,443, in 1896.

Clays.—The general volume of the industry remained about equal to that of 1895, when the value of the brick clays aggregated $9,000,000 in the crude state, and that of all other clays $800,000. The production of improved brick in fancy colors has increased noticeably. In the pottery industry much ground for encouragement is shown in the quality of new art products in Trenton, New Jersey, and East Liverpool and Zanesville, Ohio.

The total value of the wares made from clay in 1896 aggregated \$62,341,853, against \$65,319,806 in 1895.

Cement.—Natural rock cement showed the same slight increase which it did in 1895, from 7,741,077 barrels (of 300 pounds each), worth \$3,895,424, in 1895, to 7,970,450 barrels, worth \$4,049,202, in 1896. Meanwhile, the Portland cement industry progressed markedly, from a product of 990,324 barrels (of 400 pounds each), worth \$1,586,830, in 1895, to 1,543,023 barrels, worth \$2,424,011, in 1896. The number of Portland cement works increased from 22 to 26, and those of natural rock cement from 67 to 71.

ABRASIVES.

Millstones.—The product showed little change from 1895, i. e., \$22,542 in 1895 and \$22,567 in 1896. The industry is supplied chiefly by imported stones.

Grindstones.—The product nearly regained the position it held in 1893, when its value was \$338,787. In 1896 the value was \$326,826. In 1895 it was only \$205,768.

Corundum and emery.—The product showed little change in quantity or value; 2,102 short tons, worth \$106,256, were produced in 1895, chiefly from Massachusetts, New York, North Carolina, and Georgia. In 1896 the 2,120 short tons produced were sold for \$113,246.

Oilstones.—The value of the product declined from \$155,881 in 1895 to \$127,098 in 1896.

CHEMICAL MATERIALS.

Phosphate rock.—In spite of efforts of the Florida producers to greatly restrict production, the result was 930,779 long tons as the total for the United States, compared with 1,038,551 long tons in 1895. The prices were again low, the total value in 1896 being \$2,803,372.

In addition to the phosphate deposits lately found in Hickman, Lewis, and Perry counties, Tennessee, further valuable discoveries were made at Mount Pleasant, Maury County. Here the leaching of phosphatic limestone in some instances, and the replacement of limestone by phosphate in others, have left quite high-grade rock, which has been mined at exceptionally low cost.

Gypsum.—The product declined sharply. In 1895, 265,503 short tons were produced, and in 1896 only 224,139. The value fell from $797,447 in 1895 to $572,344 in 1896, and the average price decreased from $3 to $2.55 per ton. Over 43 per cent of the product in 1896 was from the Western States—Iowa, Kansas, Indian Territory, South Dakota, and Texas.

Salt.—Increased production and continued large importation had a demoralizing effect upon prices in 1896. Domestic production increased from 13,669,649 barrels in 1895 to 13,850,726 in 1896. The value declined from $4,423,084 in 1895 to $4,040,839 in 1896. The average price realized by producers in 1895 was 32 cents per barrel of 280 pounds, a decline of 4½ cents per barrel from the price in 1894. In 1896 the average price per barrel was 29 cents, a little over one-tenth of 1 cent per pound. The principal feature of interest outside of the decline in value was the increase of more than 100 per cent in the production of Ohio, which replaced about an equal amount from Michigan and New York, the product in those States having decreased about the same amount as the product of Ohio increased.

Bromine.—The industry is chiefly in the hands of the sales syndicate, and showed a slight increase, to 546,580 pounds, in 1896, valued at the works at $144,501. In 1895 517,421 pounds were made, worth $134,343. The product in 1896 includes the bromine in potassium bromide made directly.

Sulphur.—The industry shows some life, increasing from 1,800 tons in 1895 to 5,260 tons in 1896. The increase was due to success in operating the Louisiana deposits by Frasch's process. The increased price due to the Sicilian sulphur combination excited search for other deposits, with the result of attracting some attention to the deposits in Texas.

Pyrite.—The product increased slightly, but the total value shows a decline. The product was 115,483 long tons in 1896, worth $320,163, while 99,549 long tons were mined in 1895, worth $322,845. In spite of low prices search for a more extended supply of pyrite in the United States is quite active in consequence of the higher price of sulphur.

Borax.—The product went up to the normal level of

13,508,000 pounds, worth $675,400, all from California and Nevada.

Fluorspar.—The product is small, but shows a satisfactory increase from 4,000 short tons in 1895, worth $24,000, to 6,500 tons in 1896, worth $52,000. During the year a new deposit was opened at Marion, Kentucky.

Chrome iron ore.—The chief interest in the industry lies in the development of a new deposit in Newfoundland, from which shipments have been made to Pittsburg for use as a refractory furnace lining. The higher-grade portion was sent to Baltimore and Philadelphia for the manufacture of bichromates. The United States product came from California, and aggregated 786 long tons, the smallest product in years.

PIGMENTS.

Metallic paint.—The product was 24,465 short tons, of which 9,660 tons went into mortar colors. This is the smallest product yet recorded.

Ocher, umber, and sienna.—The product of ocher increased from 12,045 short tons in 1895 to 14,074 short tons in 1896, but the value of the product decreased from $139,328 to $136,458. The output of umber decreased from 320 short tons, worth $4,350, in 1895 to 165 short tons, worth $2,646, in 1896. Sienna increased in amount from 275 short tons in 1895 to 395 short tons in 1896, with a decline in value from $6,950 to $5,416.

Venetian red.—This product decreased from 4,595 short tons in 1895 to 4,138 short tons in 1896, with a slight increase in the average price per ton, from $22.40 to $22.68.

Zinc white.—This paint remained practically stationary at 20,000 short tons, worth $1,400,000.

Barite.—The product declined from 21,529 long tons, worth $68,321, in 1895 to 17,068 tons, worth $46,513, in 1896. This was less than in any year since 1887. The value has decreased 66 per cent in four years.

Cobalt oxide.—The product declined from 14,458 pounds, worth $20,675, in 1895 to 10,700 pounds, worth $15,301, in 1896. It is entirely a by-product in this country.

MISCELLANEOUS.

Fuller's earth.—This product is practically limited to Quincy, Florida, though extensive beds have been found in other parts of Florida and in Georgia, which will lead to further developments in the industry. The product was 9,872 short tons, worth $59,360, compared with 6,900 tons, worth $41,400, in 1895.

Precious stones.—The product declined again. The value in 1895 was $113,621, and in 1896 only $97,850. Blue sapphires were discovered in Montana during the year.

Mica.—The production continues to be dominated by the foreign trade, but increased slightly, from $55,831 in 1895 to $67,191 in 1896.

Feldspar.—Product in 1896, for potters' use, 7,614 long tons, worth $30,700.

Flint.—This is chiefly quartz ground for potters' use. The product aggregated 12,274 long tons, worth $21,038, unground.

Asphaltum.—There was a considerable increase in the product and value of bituminous rock, which is included in this report, bringing the total product from 68,163 short tons in 1895 to 80,503 in 1896, and the value from $348,281 to $577,563.

Asbestos.—The product is small—504 tons in 1896, worth $6,100.

Infusorial earth.—There was a slight decrease in product, to a value of $16,042 in 1896, against $20,514 in 1895.

Magnesite.—The California product decreased from 2,200 short tons in 1895, worth $17,000, to 1,500 tons, worth $11,000, in 1896.

Graphite.—The product of graphite in 1896 declined to $48,460; in 1895 it was $52,582.

Mineral waters.—In this industry there was a slight increase in quantity, from 21,463,543 gallons in 1895 to 25,795,312 gallons in 1896. The general decline in prices was evident in a decline of the total value from $4,254,237 in 1895 to $4,136,192 in 1896.

TOPOGRAPHIC BRANCH.

The general organization of the Topographic Branch has remained practically as it was during the preceding year, some slight modifications having been made to meet special requirements.

With reference to the character of the work, there are two divisions, namely, a Triangulation Division, under which falls everything relating to the control for the topographic mapping, that is, the furnishing of initial points, including astronomic location, base-line measurement, triangulation, and primary traverse; and a Topographic Division, to which belong all the details pertaining to the preparation of the topographic map of the United States other than those mentioned above, including spirit leveling.

For the purpose of administration there have been throughout the year five sections:

Atlantic Section, under Mr. H. M. Wilson;
Central Section, under Mr. John H. Renshawe;
Rocky Mountain Section, under Mr. E. M. Douglas;
Pacific Section, under Mr. R. U. Goode;
Indian Territory Section, under Mr. C. H. Fitch.

In the bill providing for the topographic surveys for the current fiscal year the following paragraph was included:

> That hereafter in such surveys west of the ninety-fifth meridian elevations above a base level located in each area under survey shall be determined and marked on the ground by iron or stone posts or permanent bench marks, at least two such posts or bench marks to be established in each township or equivalent area, except in the forest-clad and mountain areas, where at least one shall be established, and these shall be placed, whenever practicable, near the township corners of the public-land surveys; and in the areas east of the ninety-fifth meridian at least one such post or bench mark shall be similarly established in each area equivalent to the area of a township of the public-land surveys.

In accordance with these requirements of law, it became necessary to do spirit leveling of a higher order of accuracy than has been customary in the past. These levels, whenever practicable, and in nearly all cases, were run in circuits, a limiting error of closure being established, so as to eliminate any possibility of error beyond the very small limit allowed. The results of the level lines were permanently stamped to the nearest foot on bench marks of specially designed patterns, three forms being used, as follows:

First. A wrought-iron post 3½ inches in diameter and 4 feet in length, the bottom being flared out to a width of 12 inches, so as to hold it more firmly in the ground, and the top surmounted by a brass cap, securely riveted and suitably inscribed, on which the elevations are to be stamped. This form was used in soil, about two-thirds of its length being sunk in the ground.

Second. A bronze tablet, similar on its upper surface to that used on the post, but provided with a tongue on its inner side, by means of which it can be neatly and firmly cemented in holes drilled in dressed-stone surfaces, such as buildings, bridge abutments, etc.

Third. A copper plug or bolt about 4 inches in length and an inch in diameter, for insertion into rock surfaces when it is not practicable to use either the posts or the tablets.

In addition to these permanent bench marks, which were placed at an average interval of 5 or 6 miles, temporary bench marks, which will remain recoverable for many years, were established at intervals of about 1 mile

This leveling has raised the standard of the topographic maps, by improving the number and quality of the elevations upon which the contouring is based, and has furnished reliable bench marks which can be utilized in any engineering enterprise requiring accurate elevations.

Of spirit levels 10,840 miles were run, resulting in the establishment of 1,820 permanent bench marks. The average cost of the leveling was $4.75 per linear mile and $1.40 per square mile of area topographically mapped. By the topographic surveys 27,466 square miles were covered, this area being distributed through 25 States and Territories, and the average cost of topography per square mile, including leveling, was $4.60. The distribution of the topographic and leveling work in the various States and Territories is shown on Pls. I and II.

The following table gives the details relating to topography and spirit leveling for the fiscal year:

Topographic surveys of the United States Geological Survey in 1896–97, including miles of levels run and permanent bench marks established.

State or Territory.	Contour interval.	Scale of publication.		Total area.	Levels.	
		1:62500.	1:125000.		Distance run.	Number of bench marks.
	Feet.	*Sq. miles.*	*Sq. miles.*	*Sq. miles.*	*Miles.*	
Alabama	100	....	155	155	65	10
Arkansas	20	250	....	250	179	15
California	25, 50, 100	590	731	1,321	338	80
Colorado	25, 100	238	947	1,185	404	77
Delaware	20	29	592	621	40	14
Georgia	100	....	1,195	1,195	278	38
Idaho	100	....	525	525	140	25
Illinois	20	100	300	400	129	7
Indian Territory	50	....	7,678	7,678	4,174	700
Iowa	20	....	850	850	181	36
Kansas	....	....	....	....	43	15
Maryland	20	176	460	636	120	20
Michigan	20	144	....	144	90	6
Missouri	50	....	900	900	316	35
Montana	100	....	433	[a]883	199	29
Nebraska	20	....	1,800	1,800	365	73
New York	20	2,570	....	2,570	925	105
North Carolina	50, 100	120	625	[b]770	597	108
Oregon	25, 100	100	210	310	130	24
Pennsylvania	20	25	....	25	....	....
South Dakota	20	....	1,800	1,800	319	40
Texas	25	....	1,040	1,040	1,098	222
Utah	....	....	....	[c]12	....	....
Vermont	20	219	....	[d]234	40	8
Washington	25, 100	120	772	892	186	40
West Virginia	100	....	1,250	1,250	180	35
Wyoming	....	....	....	....	304	58
Total	....	4,681	22,263	27,446	10,840	1,820

[a] 450 square miles on scale 1:250000; contour interval, 200 feet.

[b] 25 square miles on scale 1:15840; contour interval, 10 feet.

[c] Scale 1:9600; contour interval, 20 feet.

[d] 15 square miles on scale 1:30000; contour interval, 20 feet.

The following table shows the total areas and the percentages surveyed to date in the various States and Territories.

Twenty-five per cent of the total area of the country has been covered by the topographic surveys.

Table showing, by States and Territories, the present condition of topographic surveys and the areas surveyed in 1896–97.

State or Territory.	Total area.	Area surveyed in 1896–97.	Area surveyed to date.	Per cent.
	Square miles.	*Square miles.*	*Square miles.*	
Alabama	52,250	155	15,063	29
Arizona	113,020	....	56,740	50
Arkansas	53,850	250	13,535	25
California	158,360	1,321	45,647	29
Colorado	103,925	1,185	32,871	32
Connecticut	4,990	....	4,990	100
Delaware	2,050	621	644	31
District of Columbia	70	....	70	100
Florida	58,680	....	1,821	3
Georgia	59,475	1,195	14,007	24
Idaho	84,800	525	12,031	14
Illinois	56,650	400	3,999	7
Indiana	36,350	....	18	....
Indian Territory	31,400	7,678	22,313	71
Iowa	56,025	850	5,563	10
Kansas	82,080	....	61,094	74
Kentucky	40,400	....	10,246	25
Louisiana	48,720	....	7,492	15
Maine	33,040	....	3,810	12
Maryland	12,210	636	7,617	62
Massachusetts	8,315	....	8,315	100
Michigan	58,915	144	1,836	3
Minnesota	83,365	....	1,153	1
Mississippi	46,810	....	29	....
Missouri	69,415	900	27,988	40
Montana	146,080	883	34,733	24
Nebraska	77,510	1,800	22,188	28
Nevada	110,700	....	28,022	25
New Hampshire	9,305	....	1,998	21
New Jersey	7,815	....	7,815	100
New Mexico	122,580	....	27,777	22
New York	49,170	2,570	13,314	27
North Carolina	52,250	770	12,252	23
North Dakota	70,795	....	5,515	8
Ohio	41,060	....	49	....
Oklahoma	39,030	....	4,146	10

Table showing, by States and Territories, the present condition of topographic surveys and the areas surveyed in 1896–97—Continued.

State or Territory.	Total area.	Area surveyed in 1896–97.	Area surveyed to date.	Per cent.
	Square miles.	*Square miles.*	*Square miles.*	
Oregon	96, 030	310	12, 260	12
Pennsylvania	45, 215	25	6, 507	15
Rhode Island	1, 250	....	1, 250	100
South Carolina	30, 570	....	3, 900	12
South Dakota	77, 650	1, 800	14, 415	18
Tennessee	42, 050	....	17, 641	42
Texas	265, 780	1, 040	56, 637	21
Utah	84, 970	12	62, 644	74
Vermont	9, 565	234	2, 809	29
Virginia	42, 450	....	29, 227	68
Washington	69, 180	892	2, 509	4
West Virginia	24, 780	1, 250	16, 832	68
Wisconsin	56, 040	....	5, 169	9
Wyoming	97, 890	....	11, 024	11
	3, 024, 880	27, 446	759, 525	25

DIVISION OF TRIANGULATION.

In the Atlantic Section an extension of the triangulation in the Adirondack region, New York, was begun in the early part of June by Mr. W. J. Peters. His work was based on two primary stations of the United States Coast and Geodetic Survey, Hamilton and Prospect. He occupied seven additional stations to the northward, and located seven other points by intersection. Later in the season he was engaged in furnishing control for the southern-central portion of New York by extending a belt of single triangles westward from Swale, Orange, and Harrison, stations of the New York State Survey (Gardiner). He occupied six stations in this region.

A limited area in Tennessee, about 35 miles northeast of Nashville, was controlled by triangulation during the months of August and December, inclusive, by Mr. Gilbert Thompson. He occupied six stations. Previous to this he extended a primary traverse along the Louisville and Nashville Railroad from Columbia to Brentwood (a triangulation station located the preceding year), the distance traversed being 32 miles. Primary traverse was afterward extended westward by Mr. W. J. Peters from Brentwood to the Tennessee River at Johnsonville, a distance of 65 miles, with a branch line 60 miles in length southward from Dickson to Mannie.

In the Central Section the astronomic location of Sioux Falls, South Dakota, was obtained early in October by Mr. S. S. Gannett—the longitude by time observation and telegraphic exchange of clock signals with the Washington Observatory at St. Louis, and the latitude by observation upon circumzenith stars by the Talcott method. This position, in connection with the traverse line, 216 miles in length, run by Mr. George T. Hawkins, furnished control for the topographic work in southeastern South Dakota.

A belt of triangulation, consisting of nineteen stations, forming a series of quadrilaterals, was extended westward up the North Platte Valley, Nebraska, by Mr. George T. Hawkins during July and the first week in August. This triangulation is based upon the astronomic position of North Platte as determined by the Wheeler Survey in 1874 and upon a base line near the same place measured by Mr. E. M. Douglas in 1892.

The St. Croix region in Minnesota and Wisconsin was next controlled by a primary traverse line run by Mr. Hawkins during the latter part of August, the initial point of this traverse being Ramsey, a triangulation station of the United States Coast and Geodetic Survey in the northeastern portion of St. Paul.

Mr. Hawkins was then assigned to primary traverse work in North Dakota, running a line from the United States Geological Survey astronomic pier at Jamestown northward to Covington, thence southeastward to a point at Odell, located in 1892 by traverse from the same pier.

The eastern-central portion of Iowa was controlled by a line 210 miles in length traversed by Mr. Hawkins during the latter part of October and a portion of November. The triangulation of the Mississippi River Commission furnished the initial and closing positions for this line.

Mr. Hawkins next traversed the Wabash Railroad from Seehorn—a triangulation station of the Mississippi River Commission—to Springfield, Illinois, completing a circuit by extending a line northward to Havana and thence southward to Jacksonville.

Control for the Hot Springs special map, Arkansas, was obtained in December by Mr. Hawkins, who occupied two of the Geological Survey stations established in 1888, and also three new stations.

In the Rocky Mountain Section, control being desired for the Big Horn Basin, it was decided to begin work at or near Sheridan, Wyoming. The astronomic position of this place was determined by Mr. S. S. Gannett in July. Telegraphic connection for longitude was had with the Washington Observatory at St. Louis, and the latitude was obtained by the Talcott method. A base line 4 miles in length was selected and measured on the Burlington and Missouri Railroad at Ranchester, 18 miles northwest of Sheridan. This line was connected by triangulation with the astronomic pier by Mr. W. S. Post, who also extended triangulation westward across the Big Horn Mountains, controlling an area of approximately 6,000 square miles. He occupied twenty-four stations during the season extending from July to November.

In Colorado, Prof. A. H. Thompson supplemented his triangulation of the two preceding seasons by occupying ten stations for the control of the survey of the Nepesta, San Carlos, and Canyon quadrangles. Professor Thompson also extended the triangulation along the Arkansas Valley in Kansas westward to the Colorado State line, and furnished eight additional points for the control of the work in the Lakin quadrangle, the total number of stations occupied by him in Kansas being twenty-four.

A check base line and astronomic position being found necessary in Texas, in November Mr. S. S. Gannett measured a line 4 miles in length at Spofford, a station of the Southern Pacific Railway 130 miles west of San Antonio. He also located by astronomic observation a pier near the east extremity of the base, the longitude of the pier, as usual, being determined telegraphically from the Washington Observatory at St. Louis, and the latitude by the Talcott method. During the winter months, December 20 to March 30, Mr. H. L. Baldwin, jr., extended triangulation eastward from Spofford, Texas, occupying twenty-two stations and locating sixteen others, thus furnishing ample control for the work in five quadrangles.

In the Pacific Section, control for the surveys in the vicinity of Spokane, Washington, was initiated by Mr. S. S. Gannett, who obtained the latitude of the pier in the court-house grounds, the longitude of which had been determined by the United States Coast and Geodetic Survey in 1888. A base line 5 miles in length was then measured on a tangent of the Northern Pacific Railroad just east of Spokane, and was extended northward and eastward by the occupation of six stations.

The triangulation in southern Oregon was extended southward by Mr. W. T. Griswold and connected with the triangulation brought up from California in 1887. Three or more positions were determined for the control of the work in the tier of quadrangles extending eastward from the Pacific Ocean and including the quadrangle south of the Roseburg.

For the control of the work on the Tintic special map, Utah, and also for that on an atlas sheet on the scale of 1 : 62500, four stations were occupied by Mr. Gannett in September. Three primary stations in the transcontinental belt of the United States Coast and Geodetic Survey were used as the initial positions, and the locations were obtained by the three-point method.

Triangulation in the Indian Territory was carried on by two parties—one under the direction of Mr. C. F. Urquhart, who extended his work of the preceding year northward through the territory of the Cherokee Nation to the Kansas line; the other by Mr. H. L. Baldwin, jr., who started from a station near the Savanna base line and extended triangulation eastward, connecting with the Arkansas triangulation of 1887.

Pl. II, in pocket, shows the condition and progress of astronomic location, primary triangulation, and primary traverse, as well as of spirit leveling.

DIVISION OF TOPOGRAPHY.

ATLANTIC SECTION.

This section has remained throughout the year under the charge of Mr. H. M. Wilson. Topographic mapping was planned for and executed in nine States, namely: Vermont, New York, Delaware, Maryland, Virginia, West Virginia, North Carolina, Georgia, and Alabama, and also in the District of Columbia. Cooperative agreements were arranged with three States, the following sums being provided by them in addition to the regular appropriation by the General Government: New York, $15,000; Maryland, $1,000; North Carolina, $3,700. The basis of these agreements was generally that the expenses of a particular survey should be equally divided between the cooperating parties, the United States usually paying the salaries and the State interested providing for the necessary field expenses.

Work was prosecuted by eleven topographic parties, to each of which was attached a subparty for leveling, and there was one independent leveling party. The territory covered by the survey embraced 7,431 square miles, and this area was classified as follows: On the scale of 1:125000, 4,277 square miles; on the scale of 1:62500, 3,139 square miles; and on special scales, 35 square miles. Of the above, 3,225 square miles consisted of a complete revision of work previously done. In connection with the topographic work, there were 2,245 miles of spirit levels run and 338 permanent bench marks established. In addition, the survey of the Washington (D. C.) quadrangle was completely revised during the spring, in order to bring it up to the quality of the surveys which have been executed in more recent years. Also, a resurvey of a small portion of the Goochland (Virginia) quadrangle was made by Mr. A. M. Walker during the latter part of February.

Vermont.—In this State field work was inaugurated early in June under the general direction of Mr. J. H. Jennings, and was carried on intermittently during the season by him or his principal assistant, Mr. A. M. Walker, assisted by a traverseman. Mr. James McCormick was also detailed to this party during the month of July. The result of the season's work was the mapping of the Bennington quadrangle, in Bennington County, comprising an area of 219 square miles, on the scale of 1:62500, and also some revision for the correction of the Whitehall, Wilmington, Manchester, and Greylock sheets. Further, there was made on the scale of 1:30000, and with a contour interval of 10 feet, a survey of the area included in the slate belt of Vermont, covering portions of the Castleton and Pawlet quadrangles and embracing an area of 15 square miles. In connection with the work in this State, 40 miles of levels were run and 8 permanent bench marks were established.

New York.—A larger amount of work was done in this State than elsewhere, owing to the cooperative appropriation made by the State legislature, above referred to. Four principal topographic parties were in the field from June 1 to about the middle of November, one of which, under Mr. W. M. Beaman, with two assistants, completed the mapping of the Newcomb quadrangle, and another, under Mr. W. H. Lovell, with two assistants, completed that of the Thirteenth Lake quadrangle and in addition one-third of the Indian Lake, the above areas being included in Essex, Hamilton, and Warren counties. Elsewhere in New York were two large parties—one in the central part of the State, under the general direction of Mr. J. H. Jennings, assisted by Messrs. C. C. Bassett and A. M. Walker, which mapped the Utica, Skaneateles, Moravia, and Auburn quadrangles, in Oneida, Herkimer, Onondaga, Cayuga, and Tompkins counties; the other in the western part of the State, under the general direction of Mr. Frank Sutton, assisted by Messrs. E. B. Clark, R. D. Cummin, and J. H. Wheat, and also by Mr. Nat. Van Doren from June 1 to August 15, which mapped the Olean, Lockport, Medina, and Albion quadrangles, in the counties of Orleans, Genesee, Niagara, Erie, Cattaraugus, and Allegany, and the Olcott, Ridgeway, and Oak Orchard quadrangles, fronting on Lake Ontario in Niagara and Orleans counties.

In connection with the work in New York, which embraced the survey of 2,570 square miles on the scale of 1:62500, 925 miles of spirit levels were run and 105 permanent bench marks were established.

Maryland-Delaware-Pennsylvania.—A party under the general direction of Mr. H. S. Wallace, assisted by Mr. J. W. Thom throughout the season and by Mr. Albert Pike after November 1, was in the field from June 1 to November 20, and succeeded in completing the mapping of the Elkton quadrangle on the scale of 1:62500, embracing an area of 230 square miles in Cecil County, Maryland, Chester County, Pennsylvania, and Newcastle County, Delaware; also the Dover quadrangle, on the scale of 1:125000, and a small area necessary to complete the Delaware Bay quadrangle, making a total of 1,052 square miles surveyed on the latter scale, embraced in Queen Anne, Cecil, and Kent counties, Maryland, and Newcastle and Kent counties, Delaware. In connection with the topographic work in Maryland and Delaware, 160 miles of levels were run and 34 permanent bench marks were established.

West Virginia.—A party under Mr. Hersey Munroe, with Mr. Albert Pike and two other assistants, was in the field from June 10 to November 1, and completed the resurvey of the Oceana quadrangle and about one-half of the Charleston, embracing a total area of 1,250 square miles, on a scale of 1:125000, in the counties of Logan, Boone, Wyoming, McDowell, Kanawha, Putnam, and Lincoln. In this work 180 miles of levels were run and 35 permanent bench marks were established.

North Carolina.—Under cooperation with the State, detailed surveys were prosecuted in two localities, Chapel Hill and Pisgah. Work was commenced in the former, in Orange County, by Mr. W. L. Miller about the middle of May, and was continued until the latter part of June. Mr. Miller was then transferred to the Pisgah locality, but returned to the Chapel Hill on November 20 and completed the work on February 1, surveying an area of 25 square miles on the scale of 1:15840, with a contour interval of 10 feet. From July 15 to November 20 Mr. Miller, with two assistants, was engaged in a special survey of a portion of the Pisgah quadrangle, in Transylvania and Haywood counties, surveying 120 square miles on the scale of 1:62500.

The resurvey of the Pisgah quadrangle on the scale of

1:125000 was inaugurated under Mr. R. D. Cummin early in June. Mr. Cummin, on account of sickness, was relieved by Mr. J. H. Wheat on August 15, the former reporting later for duty in New York State. Mr. Wheat had two assistants, and the party completed the survey of 625 square miles outside of the area surveyed by Mr. Miller for the special sheet. A small portion of this area was in South Carolina, including parts of the counties of Pickens, Greenville, and Oconee, the area surveyed in North Carolina being in Haywood, Buncombe, Jackson, Transylvania, and Henderson counties. In connection with the topographic work, 140 miles of levels were run and 28 permanent bench marks were established.

In November Mr. W. Carvel Hall, topographer, was detailed to run a line of precise levels in cooperation with the State geologist of North Carolina from tide water at Morehead City along the Atlantic and North Carolina Railroad and the Southern Railway, via Goldsboro, Greensboro, Salisbury, and Asheville, to the Tennessee line at Paint Rock; 457 miles of double-rodded levels were run, in the course of which there were established 80 permanent bench marks.

Georgia.—In this State a partv working under Mr. A. E. Murlin, with two assistants, was in the field from June 10 to November 30, and completed the resurvey of the Ellijay quadrangle, which had been begun the previous year, surveying 605 square miles, on the scale of 1:125000, in Fanning, Union, Gilmer, and Lumpkin counties. In connection with this work, 133 miles of levels were run and 20 permanent bench marks were established.

Georgia-Alabama.—Mr. Merrill Hackett, assisted by Mr. Nat. Van Doren from August 15 to September 15, and by two other assistants, completed the resurvey of the Rome quadrangle and a small portion of the Fort Payne, the field season extending from June 10 to the first part of November. The party mapped 745 square miles, on the scale of 1:125000, in Chattooga, Gordon, Floyd, and Polk counties, Georgia, and Cherokee County, Alabama; and 210 miles of spirit levels were run and 28 permanent bench marks were established.

CENTRAL SECTION.

Mr. John H. Renshawe has remained in charge of this section. Topographic work, including leveling, was prosecuted in Michigan, South Dakota, Iowa, Illinois, Nebraska, Missouri, and Arkansas. Five field parties were maintained, to each of which was attached a level subparty, with the result of bringing to completion ten atlas sheets, all of which was new work. The area surveyed embraced 6,144 square miles, of which 494 square miles were on the scale of 1:62500 and 5,650 square miles were on the scale of 1:125000. A total of 1,729 miles of levels were run, and 247 permanent bench marks were established.

Michigan.—Work was continued in the northern peninsula, in portions of Baraga and Marquette counties, by Mr. Robert Muldrow, who surveyed 144 square miles, on a scale of 1 : 62500. This resulted in the completion of the field work in the Witbeck quadrangle; and in connection with the topographic work 90 miles of levels were run and six permanent bench marks were established. Work in this district was commenced June 15 and completed at the end of September, when Mr Muldrow was transferred to the Hot Springs district of Arkansas.

South Dakota.—Work was continued in the James River Valley, in the southern part of the State, by a party in charge of Mr. W. H. Griffin, assisted by Mr. Basil Duke. Field work was commenced about June 15 and continued until the first part of November, during which time the Olivet and Parker quadrangles, embracing portions of Hutchinson, Yankton, Bonhomme, Turner, and Clay counties, were surveyed, on a scale of 1:125000, and 319 miles of levels were run, resulting in the establishment of 40 permanent bench marks.

Iowa-Illinois.—Mr. R. C. McKinney, assisted by Mr. Nat. Tyler, jr., was assigned to the duty of completing the survey of the Maquoketa, Anamosa, and Clinton quadrangles, on the scale of 1:125000. These quadrangles comprise portions of Dubuque, Jackson, Jones, Linn, and Delaware counties, Iowa, and extend across the Mississippi River in Illinois, including parts of the counties of Whiteside, Henry, Rock Island, and Dubuque. The party reached the field about the middle of June, and operations were closed on November 1, upon completion of the work assigned, embracing an area of 1,150 square miles. In connection with the topographic work in Iowa, 181 miles of levels were run and 36 permanent bench marks were established, and in Illinois there were 55 miles of levels with 7 permanent bench marks.

In addition, a party under Mr. Paul Holman commenced work on November 1 in the Havana quadrangle, Illinois, but was forced to discontinue on December 1 because of bad weather. During this time there was mapped an area of about 100 square miles, on the scale of 1:62500, in Fulton and Mason counties, and 74 miles of levels were run, but, owing to a failure in the delivery of the iron posts, no permanent bench marks were established.

Nebraska.—The Sidney and Browns Lake quadrangles, portions of Deuel and Cheyenne counties, in the western part of the State, were surveyed by Mr. H. B. Blair, on a scale of 1:125000, the party taking the field about the middle of June and disbanding about November 20. There were 365 miles of levels run and 73 permanent bench marks established.

Missouri.—Topographic work was continued in the iron region, in the eastern part of the State. Mr. Paul Holman, assisted by Mr. Duncan Hannegan, was assigned to this district, and surveyed the De Soto quadrangle, on a scale of 1:125000, comprising in its area portions of Franklin, St. Louis, Jefferson, Washington, and St. François counties. This work was completed by the end of October, the party having commenced work on June 15. There were 316 miles of spirit levels run, resulting in the establishment of 35 permanent bench marks.

Arkansas.—The Hot Springs quadrangle was surveyed on a scale of 1:125000 in 1888. An atlas sheet on the scale of 1:62500 was, however, desired, including a portion of the area formerly surveyed and an additional area to the south, and to this task was assigned Mr. Robert Muldrow, after the completion of his work in Michigan, with Mr. Duncan Hannegan as assistant. The area was successfully mapped and the party disbanded on January 1. In connection with the topography, 179 miles of levels were run and 15 permanent bench marks were established.

Wyoming.—In this State 150 miles of levels were run and 35 permanent bench marks established by an independent party in the Goshen Hole district, north of Cheyenne.

ROCKY MOUNTAIN SECTION.

This section has been throughout the year, as heretofore, under the direction of Mr. E. M. Douglas. Topographic work was carried on by four parties—to each of which was attached a subparty for leveling—in Montana, Colorado, and Texas; and, in addition, leveling work was instituted by three additional parties, as preliminary to future topographic work in Wyoming, Kansas, and Texas. The total area surveyed amounted to 3,108 square miles, of which 1,397 square miles consisted of revision. Classified by scale, 238 square miles were on the scale of 1:62500; 2,420 square miles on the scale of 1:125000, and 450 square miles on the scale of 1:250000. There was a total of 1,898 miles of levels run, and 366 permanent bench marks were established.

Montana.—The survey of the Boulder quadrangle, on the scale of 1:125000, in Jefferson County, was commenced early in July by Messrs. R. H. Chapman and W. J. Lloyd. Frequent storms delayed this work during the season, and it was discontinued in the early part of November after the completion of about two-thirds of the quadrangle. Mr. Chapman was engaged for six weeks in August and September upon revision work in connection with the Northern Transcontinental maps of the Neihart mining district and vicinity, an area included in the Fort Benton and Little Belt quadrangles, in Cascade and Meagher counties. The scale of this work was 1:125000. A few days were also spent by Mr. Chapman, during the latter portion of the season, in procuring additional data for the Butte Special map, in order to bring it up to date. In connection with the work in the Boulder quadrangle, 199 linear miles of levels were run and 29 permanent bench marks were established.

Colorado.—Topographic work was carried on in two localities in this State—in the Durango quadrangle, La Plata County, by Mr. Frank Tweedy, on the scale of 1:62500; and in the Apishapa quadrangle, Pueblo, Las Animas, and Otero counties, by Mr. W. H. Herron, on the scale of 1:125000. Mr. Tweedy commenced the work June 26 and completed it November 3. In connection therewith, 101 miles of levels were run and 9 permanent bench marks were established. Mr. Herron commenced a resurvey of the Apishapa quadrangle on July 18 and completed it early in December. In connection with the work in this vicinity, 303 miles of levels were run and 68 permanent bench marks were established.

Texas.—The Uvalde quadrangle, in Uvalde County, was surveyed by Mr. T. M. Bannon, who commenced work about July 1 and completed the survey the latter part of January. In connection with this work, and for the control of the work in the Hondo quadrangle to the east, 567 miles of spirit levels were run and 106 permanent bench marks were established.

An independent level party was maintained in Texas, which ran two large circuits, commencing at San Antonio, one including Sabinal, Bandera, and Kerrville, and also extending to Uvalde; the other including Flatonia and Bastrop; the total number of miles on the two circuits being 531, and the number of bench marks established 116.

Wyoming.—In this State level work was instituted for the control of the Big Horn Basin, the line commencing at Red Lodge, Montana, and extending southward and forming a circuit including Clarke, Eagles Nest, and Lovell. A line was also run from Eagles Nest via Corbett to Shoshone City, resulting in a total of 154 miles of levels and 23 permanent bench marks.

Kansas.—In this State 43 miles of levels were run and 15 permanent bench marks established for the control of the work in the Lankin quadrangle.

PACIFIC SECTION.

This section has remained throughout the fiscal year in charge of Mr. R. U. Goode. Topographic work was prosecuted in California, Oregon, Washington, Idaho, and Utah by six field parties, the result being the completion of eight atlas sheets and one special map. The area surveyed was 3,060 square miles, of which 2,238 square miles were on the scale of 1:125000, 810 on the scale of 1:62500, and 12 on a special scale of 1:9600. All of the area covered was new territory, except revision in the Haywards (California) quadrangle to the amount of 120 square miles.

To each topographic party, except in Utah, was attached a level subparty, 794 miles of level having been run and 169 permanent bench marks established.

Idaho.—The survey of the Sawtooth quadrangle, in Alturas County, was completed by Mr. E. T. Perkins, jr., assisted by Mr. A. B. Searle, 525 square miles, on the scale of 1:125000, being surveyed. Mr. Perkins reached the field in the latter part of June and finished the work assigned to him early in November. In connection with this work there were 140 miles of levels run and 25 permanent bench marks established. After the completion of the topographic work, Mr. Perkins was detailed for a period of about ten days to the Division of Hydrography, and for two weeks to the Bureau of Ethnology.

Washington.—A portion of the work done by Mr. Barnard in the Portland quadrangle, as mentioned below, was in Washington. In addition, Mr. George E. Hyde, with one traverseman, succeeded in surveying nearly the whole of the area of the Mount Stuart 30-minute quadrangle, in Kittitas County, the area covered by him embracing 772 square miles. He commenced work about the middle of June and almost finished the area assigned him; the remainder consists of about 40 square miles in the southwestern portion, from which he was driven by deep snows, being forced to abandon field work on November 27. In connection with this work 140 miles of levels were run and 33 permanent bench marks were established.

Oregon.—Mr. E. C. Barnard, with two assistants, was assigned to the work of completing the survey of the Coos Bay quadrangle, in Coos County, on a scale of 1:125000, and was engaged upon this work from the latter part of June to September 10, surveying an area of 210 square miles. In connection with this work there were 100 miles of levels run and 15 permanent bench marks established. After the completion of that work Mr. Barnard proceeded to Portland and surveyed the 15-minute quadrangle, embracing 220 square miles, which includes the city of Portland and portions of Multnomah County, Oregon, and Clarke County, Washington, finishing his work on December 18. Mr. A. B. Searle was attached to this party from October 5 to the close of the field season. On the Portland area there were 76 miles of levels run and 16 permanent bench marks established.

Utah.—The area of the Tintic Special map, embracing the mining district in the vicinity of the towns of Eureka, Mammoth, Robinson, and Silver City, in Juab and Utah counties, was surveyed by Mr. W. T. Griswold, on the scale of 800 feet to the inch, with a contour interval of 20 feet, the area covered being 12 square miles. Mr. Griswold was engaged on this work from November 3 to January 20.

California.—Two parties were assigned to work in California. Mr. R. B. Marshall completed, on a scale of 1:125000, the survey of the Dardanelles quadrangle, in the gold belt, extending over portions of Tuolumne, Alpine, and Mono counties, a small portion of which had been surveyed by Mr. R. H. McKee in 1891. This quadrangle includes the country adjacent to the Sonora Pass and the head waters of the Stanislaus and Walker rivers, and is characteristic of the High Sierra type. Mr. Marshall left the office for the field on June 10 and completed his field work on October 15, surveying an area of 731 square miles. Afterwards he was engaged upon revision work in the vicinity of San Francisco. In connection with this work a line of levels was started from Stockton and carried westward through Milton, Copperopolis, Sonora, and Sugarpine, crossing the Sierra at Sonora Pass and descending to Walker River; thus, 170 miles of levels were run and 40 permanent bench marks were established.

Mr. L. C. Fletcher was detailed for duty in the Bay region, and with one assistant, Mr. L. F. Garrard, jr., succeeded in surveying, on the scale of 1:62500, two quadrangles, the Mount Diablo and the Karquines, including portions of Contra Costa, Alameda, Napa, and Solano counties, and embracing an area of 470 square miles. The field season extended from the latter part of June to December 10, a small portion of which was spent in revising the survey of the Haywards quadrangle, in cooperation with Mr. Marshall, covering 120 square miles. In connection with the former work 168 miles of levels were run and 40 permanent bench marks were established. Included in the above was a careful line of levels from the bench mark established by the Coast Survey and the Southern Pacific Company at Oakland to Black Diamond, on Suisun Bay. At the latter point the State engineering department had established a bench mark to which all the levels in the San Joaquin and Sacramento valleys are referred, and the line above mentioned was run for the purpose of determining the correction to be applied in order to reduce the levels of the State engineering department to the datum of mean sea level.

INDIAN TERRITORY SECTION.

Reference was made in the last Annual Report to an appropriation of $200,000 for the commencement of the survey and subdivision of the unsurveyed lands in the Indian Territory, which included the entire area except the lands of the Chickasaw Nation. An additional appropriation of $200,000 was provided by Congress June 10, 1896, to continue the survey during the current fiscal year, and the Indian bill approved June 7, 1897, appropriated $100,000 for the completion of the survey. The plan of operations as approved by the Secretary of the Interior March 21, 1895, has been continued.

The general chargè of the section has been under the direction of Mr. C. H. Fitch. As the various details of the work were increased to a much larger volume during the year, notably by the addition of a number of level parties and a more extensive office force, it was found necessary to provide an assistant to Mr. Fitch in his administrative duties, and Mr.

Van H. Manning, who formerly had charge of a subdivision party, was assigned to this duty.

South McAlester has remained as the general headquarters, and all the office work is now centered at that point, the portion formerly done in Washington having been transferred in December, 1896. The field and office work was continued throughout the summer, fall, and winter months until the early part of April, when all operations were suspended on account of the exhaustion of funds for the fiscal year. Work was immediately resumed when the Indian bill for the fiscal year 1897–98 became law.

A summary of the mileage of the subdivisional survey is as follows: Total number of miles surveyed from July 1, 1896, to April 17, 1897, 16,079. Of this mileage, 598 are standard lines, 2,434 are township exteriors, 352 are meander lines, and 12,695 are subdivision or section lines. The total mileage to date is 38,411 miles. On June 1 all standard lines were finished, and there remained about 320 miles of exteriors to run and about 9,500 miles of subdivision lines, including the necessary meanders.

The topographic mapping has been prosecuted contemporaneously with the subdivisional work, an area of 7,678 square miles having been surveyed since July 1, 1896, making a total of 17,430 square miles since the beginning of the work. In connection with the topographic work, and in order to comply with the provisions of the law relating to the establishment of bench marks in the various areas under survey, 4,174 miles of spirit levels were run, of which 1,124 miles were along lines of railroad and 3,050 miles along township lines. In this work about 700 permanent bench marks were established. In some cases it was found to be practicable to substitute for the spirit leveling elevations by vertical angles, and 4,837 miles of such work were done.

The topographers who during the year have been in charge of subdivision parties and at the same time have been personally engaged in the detailed topographic mapping are Messrs. C. E. Cooke, W. B. Corse, R. A. Farmer, R. H. McKee, D. C. Harrison, and W. S. Post. The assistants in charge of standard and exterior parties have been R. O. Gordon, J. Ahern, F. W. Alvord, R. A. Farmer, Oscar Jones, Sledge Tatum, W. A. Lindsay, and J. C. Wilkinson. Mr. Gordon resigned September 1, 1896, and was relieved by Mr. Tatum. Mr. Corse relieved Mr. Cooke August 17, 1896, on account of the ill health of the latter, who was afterwards ordered to Washington. Mr. Farmer relieved Mr. Corse on January 1, 1897, when Mr. Corse applied for and was granted a furlough of six months. Mr. Wilkinson at that time relieved Mr. Farmer of the charge of the exterior-line party. On November 15, 1896, Mr. Post took charge of the subdivision party which had been temporarily in charge of Mr. Jones. Mr. Ahern was transferred to the office at South McAlester January 21, 1897, being relieved by Mr. Jones.

The transcription of the subdivision notes from the rough field notes and the preparation of typewritten copies of notes and the drawing of maps and plats have progressed satisfactorily in the office at South McAlester. A summary of the office work accomplished is as follows: 201 township plats have been drawn, of which 84 had been prepared in Washington prior to January 1, and a number of plats were in course of preparation when the work was suspended in April. Typewritten copies of field notes amount to 3,706 pages. The drawing of topographic maps has been retarded, awaiting the adjustment of spirit-level lines and their connection with railroad or control lines. Five atlas sheets are in preparation.

OFFICE WORK.

The office work of the Atlantic, Central, Rocky Mountain, and Pacific sections, in Washington, which was commenced by the various topographers and assistant topographers immediately upon the close of their field seasons, has been prosecuted continuously throughout the winter and spring months by a force of about fifty men.

All the office computation relating to the Division of Triangulation was placed under the supervision of Mr. S. S. Gannett in order to secure uniformity of results. These results have been tabulated, arranged according to States and localities, and are presented in the Appendix following. Messrs.

A. H. Thompson, H. L. Baldwin, jr., W. J. Peters, C. E. Cooke, and G. E. Hawkins have been continuously engaged in computation while in the office, and other topographers have been detailed to this duty for short periods.

The office work pertaining to the Division of Topography, including the tabulation and adjustment of the results of the spirit leveling, has been carried to a satisfactory conclusion. The table herewith shows the atlas sheets, numbering 49, which have been completed and submitted for engraving during the office year 1896–97.

Topographic sheets completed in office during 1896–97.

State and sheet.	Scale.	Contour interval.
Massachusetts:		*Feet.*
Greylock	1:62500	20
Vermont:		
Bennington	1:62500	20
New York:		
Newcomb	1:62500	20
Thirteenth Lake	1:62500	20
Utica	1:62500	50
Skaneateles	1:62500	20
Auburn	1:62500	20
Moravia	1:62500	20
Medina	1:62500	20
Lockport	1:62500	20
Albion	1:62500	20
Olcott	1:62500	20
Ridgeway	1:62500	20
Oak Orchard	1:62500	20
Olean	1:62500	20
New Jersey:		
Vineland	1:62500	20
Delaware-Maryland:		
Elkton	1:125000	20
Dover	1:125000	20
West Virginia:		
Oceana (resurvey)	1:125000	100
Georgia:		
Ellijay (resurvey)	1:125000	100
Georgia-Alabama:		
Rome (resurvey)	1:125000	100

Topographic sheets completed in office during 1896–97—Continued.

State and sheet.	Scale.	Contour interval.
South Dakota:		
Mitchell	1:125000	20
Alexandria	1:125000	20
Parker	1:125000	20
Olivet	1:125000	20
Nebraska:		
Browns Creek	1:125000	20
Sidney	1:125000	20
Iowa:		
Anamosa	1:125000	20
Tipton	1:125000	20
Iowa City	1:125000	20
Davenport	1:125000	20
Iowa-Illinois:		
Clinton	1:125000	20
Maquoketa	1:125000	20
Michigan:		
Witbeck	1:62500	20
Missouri:		
De Soto	1:125000	50
Arkansas:		
Hot Springs	1:62500	20
Colorado:		
Durango	1:62500	100
Apishapa (resurvey)	1:125000	25
Texas:		
Austin (revision)	1:125000	25
Uvalde	1:125000	25
Idaho:		
Sawtooth	1:125000	100
Oregon-Washington:		
Portland	1:62500	25
Oregon:		
Coos Bay	1:125000	100
California:		
Dardanelles	1:125000	100
Mount Diablo	1:62500	50
Karquines	1:62500	25
Haywards (revision)	1:62500	25
Concord (revision)	1:62500	25
Utah:		
Tintic Special map	1:9600	20

Mr. E. M. Douglas has been in charge of the purchase and repair of instruments in office. As this Survey has no instrument shop, all repairs, except in woodwork, were made by contract with various instrument makers. Eighty aneroid barometers, 75 compasses, 45 alidades, 65 tripods, and other instruments, more or less damaged by the wear and tear of field work, were repaired. One unfinished micrometer theodolite was completed and another, which had been damaged by accident, was reconstructed. All repairs in woodwork were made by the carpenter of the Survey, Mr. N. L. King.

A general inspection of all instruments belonging to the Survey was made by Mr. S. A. Aplin, who has remained custodian of field instruments, and those condemned as worthless were turned over to the Department for sale by auction.

The recording and cataloguing of the topographic records and notebooks was commenced, under the general direction of Mr. H. M. Wilson, by Mr. S. A. Aplin, who was appointed custodian of topographic records, assisted by Mr. Joseph W. Kreuttner. This work was begun in December, since which time nearly all the topographic records in the office have been rearranged and catalogued. These records have been divided into six separate classes, namely: astronomic and base-line measurement notebooks, primary triangulation notebooks, topographic notebooks, spirit-leveling notebooks, field sheets, and miscellaneous map material. Each book or map has been numbered and filed, and a cross-index card catalogue has been prepared of all the separate entries. There were in all about 10,000 entries, which completed the final cataloguing and classification of all topographic records, except the field maps, which have been temporarily placed in cases, arranged by States and atlas-sheet names.

The stenographic and typewriting work of the Topographic Branch has been performed by Mr. Nat. G. Van Doren and Miss M. H. Corbett.

GEOGRAPHY AND FORESTRY SURVEY.

Geography.—Mr. Henry Gannett, as geographer of the Survey, continued in charge of the revision of the large map of the United States known as the "nine-sheet map." The work was largely done by Mr. Gilbert Thompson, and the corrections are now in the hands of the engraver.

The preparation of a Physical Atlas of the United States, upon which much work had been done in former years, was continued. Climatic maps were prepared, which include maps of mean monthly temperature, of annual pressure, cloudiness, and snowfall, monthly and annual maps of relative humidity, and maps showing the range in temperature between the hottest and coldest months; in all, 28 maps. Besides these, diagrams have been prepared of the slopes of the rivers of the United States.

The office collection of railroad profiles was also overhauled and an index prepared, and copies of them were made for publication. Many new profiles have been obtained by application to railroad companies, and others are still coming in. It is the purpose to readjust these profiles and publish them, and much progress has been made in the work.

In accordance with a general plan, work was commenced and well advanced upon a Geographic Dictionary of the State of Kansas. This will comprise about 5,000 titles, and will be accompanied by a map of the State on a scale of 1:500000, or about 8 miles to an inch, in 100-foot contours.

As president of the Board on Geographic Names, Mr. Gannett is obliged to give much time to its deliberations. The Survey has greater need for the results of the work of this Board than perhaps any other organization of the Government, and therefore considerable attention has always been given to the work by members of the Survey.

In order to secure information in relation to certain topographic features of which little is known, Mr. Gannett proceeded, under instructions, to the West and Southwest. He visited the Blue Mountains in northeastern Oregon for the purpose of obtaining a general idea of their structure, extent, and altitude. In this he was only partially successful, owing to the smoky condition of the atmosphere. He also visited Mount Hood, to study the surrounding topography and its glaciers. On his return, by the southern route, he made investigations of the San Bernardino Mountains and the valley lying south of them, and of the Staked Plains of Texas.

Forestry survey.—By act of Congress approved June 4, 1897, the survey of the forest reserves was placed in charge of the Director of the Geological Survey. The topographic surveys were assigned to the Pacific and Rocky Mountain topographic sections of the Survey, and the special survey of the forest areas with relation to the economic distribution of the forests was assigned to Mr. Gannett. Plans for this work were completed in June, preparatory to starting the work in July. A full report on the season's operations will accompany the Director's report for the fiscal year 1897–98.

PUBLICATION BRANCH.

DIVISION OF ILLUSTRATIONS.

The Division of Illustrations remained in charge of Mr. De Lancey W. Gill, who was assisted throughout the year by Messrs. John L. Ridgway, H. Hobart Nichols, Daniel W. Cronin, F. W. Von Dachenhausen, H. Chadwick Hunter, and J. H. Pellen. Messrs. J. C. McConnell, W. B. Gray, and W. F. Hopson, and Miss Frances Wieser were employed in the work from time to time for short periods.

Mr. Ridgway, as in previous years, assisted Mr. Gill in the general supervision of the work of the division, and also made a large number of paleontologic drawings. Essentially the same line of work was continued by the different members of the division as during the previous fiscal year.

Drawings to the number of 2,447 were produced during the year, classified as follows: geologic landscapes, 35; geologic and topographic maps, 83; geologic sections and diagrams, 680; paleontologic drawings, 1,043; miscellaneous, 606. Drawings to the number of 709 were transmitted for publication as illustrations, viz: for the Seventeenth and Eighteenth Annual Reports, 468; for ten Bulletins, 168; for one Monograph, 73. These drawings were marked for engraving as follows: lithography, 37; half-tone engraving, 279; photo-engraving, 360; heliotype, 33.

Engraved proofs of 776 drawings were received from the Public Printer, and the usual critical examination was made of the material. Mr. Gill also examined the printed edition of 94 lithographic plates and rejected all imperfect prints.

PHOTOGRAPHIC LABORATORY.

The photographic laboratory has been, as in previous years, in charge of Mr. J. K. Hillers, assisted by Messrs. C. C. Jones, John Erbach, and Charles A. Ross, photographic printers. The following statement shows the number of negatives and prints made during the year:

Photographic negatives and prints made during 1896–97.

Size.	Negatives.	Prints.
28 by 34	163	1, 009
22 by 28	63	319
20 by 24	439	1, 798
14 by 17	196	707
11 by 14	215	4, 159
8 by 10	194	795
6 by 8	286	921
5 by 8	382	1, 720
4 by 5	1, 238	1, 852
Total	3, 176	13, 280

EDITORIAL DIVISION.

TEXTUAL PUBLICATIONS.

Mr. Philip C. Warman remained in charge of this section, and was assisted throughout the year by Mr. George M. Wood, and for a portion of the time by Miss A. B. Dawson.

As during previous years, the work progressed in a highly satisfactory manner, and at the close of the fiscal year was well in hand. Following are lists of the manuscripts prepared for the printer and the proofs read and corrected during the year:

Manuscripts edited during the year 1896–97.

	Pages.
Seventeenth Annual Report (in part)	1,894
Eighteenth Annual Report (in part)	5,115
Monograph XXIX (in part)	500
Monograph XXX	255
Monograph XXXI	490
Monograph XXXII	800
Monograph XXXIV (in part)	256
Bulletin No. 87	1,006
Bulletin No. 88	188
Bulletin No. 147	66
Bulletin No. 148	744
Bulletin No. 149	329
Water-Supply Paper No. 1	60
Water-Supply Paper No. 2	197
Water-Supply Paper No. 3	180
Water-Supply Paper No. 4	127
Water-Supply Paper No. 5	58
Water-Supply Paper No. 6	112
Water-Supply Paper No. 7	64
Water-Supply Paper No. 8	45
Water-Supply Paper No. 9	168
Water-Supply Paper No. 10	100
Water-Supply Paper No. 11	204
Text for folios 28, 31, 32, 33, 34, 35, 36	403
Total number of manuscript pages edited	13,361

Proofs read during the year 1896–97.

	Pages.
Seventeenth Annual Report (in part)	3,313
Eighteenth Annual Report (in part)	402
Monograph XXVII	556
Monograph XXVIII	608
Bulletins 87, 137, 138, 139, 141, 142, 143, 144, 145, 146, 147, 148, 149	2,076
Water-Supply Papers, Nos. 1, 2, 3, 4, 5, 6	455
Text for geologic folios, Nos. 28, 30, 31, 32, 33, 34, 35 (all folio pages)	36
Total number of printed pages read	7,446

The work of the year has also included the preparation of indexes for many of the publications enumerated above.

GEOLOGIC MAPS.

This section was in charge of Mr. Bailey Willis, who was assisted by Messrs. George W. Stose and Olaf A. Ljungstedt During Mr. Willis's absence in the field the work of the section was in charge of Mr. Stose, and since his return Mr Stose has relieved him of all except the more important questions relating thereto. Mr. Ljungstedt made a special study of the phases of drafting involved in geologic maps and sections. The textual descriptions of the folios were edited by Mr. Willis and Mr. Warman jointly. Mr. Stose gave his attention largely to proof reading, while Mr. Ljungstedt was employed in the preparation of drawings.

During the year the following folios of the Geologic Atlas of the United States were transmitted by the geologists and accepted for publication:

Bidwell Bar, California.
Boise, Idaho.
Butte Special, Montana.
Holyoke, Massachusetts (surficial and under geology).
London, Kentucky.
Nueces, Texas.
Pueblo, Colorado.
Richmond, Kentucky.
Sonora, California.
Tenmile District, Colorado.
Truckee, California.
Telluride, Colorado.
Wartburg, Tennessee.

The manuscripts and drawings for the following folios were edited and the proofs read:

Bidwell Bar, California.
Briceville, Tennessee.
Buckhannon, West Virginia.
Butte Special, Montana.
Downieville, California.
Franklin, West Virginia.
Gadsden, Alabama.
Holyoke, Massachusetts (surficial and under geology).
London, Kentucky.
Morristown, Tennessee.
Nueces, Texas.
Nevada City Special, California.
Piedmont, West Virginia.
Pueblo, Colorado.
Pyramid Peak, California.
Richmond, Kentucky.
Sonora, California.
Tenmile District, Colorado.
Tazewell, Virginia.
Truckee, California.
Wartburg, Tennessee.
Yellowstone National Park.

Nine folios of the Geologic Atlas were published during the year, Nos. 27 to 35, inclusive. These are listed below, preceded by Nos. 1 to 26, previously published, making the list complete to date.

Geologic folios published during the year 1896–97, and previously.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
1	Livingston	Montana	110°–111°	45°–46°	3,354	25
2	Ringgold	Georgia Tennessee	85°–85° 30′	34° 30′–35°	980	25
3	Placerville	California	120° 30′–121°	38° 30′–39°	932	25
4	Kingston	Tennessee	84° 30′–85°	35° 30′–36°	969	25
5	Sacramento	California	121°–121° 30′	38° 30′–39°	932	25
6	Chattanooga	Tennessee	85°–85° 30′	35°–35° 30′	975	25
7	Pikes Peak (including Cripple Creek).	Colorado	105°–105° 30′	38° 30′–39°	932	25
8	Sewanee	Tennessee	85° 30′–86°	35°–35° 30′	975	25
9	Anthracite-Crested Butte.	Colorado	106° 45′–107° 15′	38° 45′–39°	465	50
10	Harpers Ferry	Virginia West Virginia Maryland	77° 30′–78°	39°–39° 30′	925	25
11	Jackson	California	120° 30′–121°	38°–38° 30′	938	25
12	Estillville	Virginia Kentucky Tennessee	82° 30′–83°	36° 30′–37°	957	25
13	Fredericksburg	Maryland Virginia	77°–77° 30′	38°–38° 30′	938	25
14	Staunton	Virginia West Virginia	79°–79° 30′	38°–38° 30′	938	25
15	Lassen Peak	California	121°–122°	40°–41°	3,634	25
16	Knoxville	Tennessee North Carolina	83° 30′–84°	35° 30′–36°	969	25
17	Marysville	California	121° 30′–122°	39°–39° 30′	925	25
18	Smartsville	California	121°–121° 30′	39°–39° 30′	925	25
19	Stevenson	Alabama Georgia Tennessee	85° 30′–86°	34° 30′–35°	980	25
20	Cleveland	Tennessee	84° 30′–85°	35°–35° 30′	975	25
21	Pikeville	Tennessee	85°–85° 30′	35° 30′–36°	969	25
22	McMinnville	Tennessee	85° 30′–86°	35°30′–36°	969	25
23	Nomini	Maryland Virginia	76° 30′–77°	38°–38°30′	938	25
24	Three Forks	Montana	111°–112°	45°–46°	3,354	50
25	Loudon	Tennessee	84°–84° 30′	35°30′–36°	969	25
26	Pocahontas	Virginia West Virginia	81°–81° 30′	37°–37°30′	951	25
27	Morristown	Tennessee	83°–83° 30′	36°–36°30′	963	25
28	Piedmont	Virginia Maryland West Virginia	79°–79′ 30	39°–39°30′	925	25
29	Nevada City:					
	Nevada City	California	121°00′25″–121°03′45″	39°13′50″–39°17′16″	11.65	50
	Grass Valley		121°01′35″–121°05′04″	39°10′22″–39°13′50″	12.09	
	Banner Hill		120°57′05″–121°00′25″	39°13′50″–39°17′16″	11.65	
30	Yellowstone National Park: Gallatin Canyon Shoshone Lake	Wyoming	110°–111°	44°–45°	3,412	75

Geologic folios published during the year 1896–97, and previously—Cont'd.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
31	Pyramid Peak	California	120°–120° 30′	38° 30′–39°	932	25
32	Franklin	Virginia West Virginia	79°–79° 30′	38° 30′–39°	932	25
33	Briceville	Tennessee	84°–84° 30′	36°–36° 30′	963	25
34	Buckhannon	West Virginia	80°–80° 30′	38° 30′–39°	932	25
35	Gadsden	Alabama	86°–86° 30′	34°–34° 30′	986	25

The following folios are well advanced and some of them will be issued soon.

Geologic folios nearing completion.

Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
Bidwell Bar	California	121°–121° 30′	39° 30′–40°	919	25
Boise	Idaho	116°–116° 30′	43° 30′–44°	864	25
Butte Special	Montana	112° 20′ 30″–112° 36′ 42″	45° 59′ 28″–46° 02′ 54″	22.8	50
Downieville	California	120° 30′–121°	39° 30′–40°	918	25
Holyoke	Massachusetts	72° 30′–73°	42°–42° 30′	885	25
London	Kentucky	84°–84° 30′	37°–37° 30′	950	25
Nueces	Texas	100°–100° 30′	29° 30′–30°	1,035	25
Pueblo	Colorado	104° 30′–105°	38°–38° 30′	938	25
Richmond	Kentucky	84°–84° 30′	37° 30′–38°	944	25
Sonora	California	120°–120° 30′	37° 30′–38°	944	25
Tazewell	Virginia West Virginia	81° 30′–82°	37°–37° 30′	950	25
Telluride	Colorado	107° 45′–108°	37° 45′–38°	236	25
Tenmile District	Colorado	106° 08′–106° 16′ 08″	39° 22′ 57″–39° 30′ 25″	62.2	25
Truckee	California	120°–120° 30′	39°–39° 30′	925	25
Wartburg	Tennessee	84° 30′–85°	36°–36° 30′	965	25

As stated in the previous report, the duties of editor of geologic maps include the examination of all original maps and sections submitted for publication as geologic folios, the reading of descriptive text for these folios, and attention to such administrative details of the work of the Survey as bear upon the preparation of material for the Geologic Atlas.

TOPOGRAPHIC MAPS.

On account of the demands made by the work of the Venezuelan Boundary Commission upon the time of Mr. Marcus Baker, editor of topographic maps, Mr. Bailey Willis was appointed acting editor in December, 1896, and he continued to discharge the duties of the position up to the close of the fiscal year, assisted by Mr. James McCormick and Mr. Herbert W. Elmore, and later in the year by Messrs. H. S. Selden and William Stranahan.

During the year the following original maps were received from the Topographic Branch of the Survey:

Albion, New York.
Alexandria, South Dakota.
Anamosa, Iowa.
Apishapa, Colorado (resurvey).
Auburn, New York.
Austin, Texas.
Bennington, Vermont.
Bristol, Virginia-Tennessee (revision).
Browns Creek, Nebraska.
Camp Clark, Nebraska.
Clinton, Iowa-Illinois.
Coos Bay, Oregon.
Dardanelles, California.
Deming, New Mexico.
De Soto, Missouri.
Dover, Delaware-Maryland.
Durango, Colorado.
East Washington, D. C.-Maryland-Virginia (revision).
Elkton, Maryland-Pennsylvania-Delaware.
Ellijay, Georgia-North Carolina-Tennessee (resurvey).
Haywards, California.
Hot Springs, Arkansas.
Karquines, California.
Lockport, New York.
Maquoketa, Iowa.
Medina, New York.
Mitchell, South Dakota.
Moravia, New York.
Mount Diablo, California.
Mount Stuart, Washington.
Newcomb, New York.
Oak Orchard, New York.
Oceana, West Virginia (resurvey).
Olcott, New York.
Olean, New York.
Olivette, South Dakota.
Palo Alto, California.
Parker, South Dakota.
Portland, Oregon-Washington.
Progress map, Indian Territory.
Ridgeway, New York.
San Jose, California.
Sawtooth, Idaho.
Sidney, Nebraska.
Skaneateles, New York.
Thirteenth Lake, New York.
Tintic Special, Utah.
Uvalde, Texas.
Vineland, New Jersey-Delaware.
West Washington, D. C.-Maryland-Virginia (revision).
Witbeck, Michigan.

The following original sheets and corrections to atlas sheets previously issued have been examined and approved for engraving:

Albany and vicinity, New York.
Albion, New York.
Amelia, Virginia.
Arroyo Grande, California.
Atlantic City, New Jersey (only legend added).
Austin, Texas.
Bennington, Vermont.
Bidwell Bar, California.
Big Trees, California.
Boise, Idaho.
Bolton, New York.
Boothbay, Maine (only legend added).
Brackett, Texas.
Bristol, Virginia-Tennessee (resurvey).
Butte Special, Montana.
Cartersville, Georgia.
Casselton, North Dakota.
Castleton, Vermont-New York.
Cayucos, California.
Chispa, Texas.
Cowee, North Carolina-South Carolina (resurvey).
Dalton, Georgia-Tennessee (resurvey).

Donaldsonville, Louisiana (only legend added).
Downieville, California.
Eagle, Wisconsin.
Eagle Mountain, Texas.
East Washington, D. C.-Maryland-Virginia.
Eckelson, North Dakota.
Elmoro, Colorado (resurvey).
Fargo, North Dakota-Minnesota.
Fonda, New York
Fort Benton, Montana.
Fort Davis, Texas.
Glens Falls, New York.
Hailey, Idaho.
Hartville, Wyoming.
Hoosick, New York-Vermont.
Kanawha Falls, West Virginia (resurvey).
Lake Placid, New York.
La Plata, Colorado.
Lincoln, Nebraska.
Little Belt Mountain, Montana.
Lockport, New York.
London, Kentucky.
Los Angeles, California (union of two sheets in one).
Marietta, Georgia.
Maynardville, Tennessee (resurvey).
Medina, New York.
Mount Hamilton, California.
Niagara Falls, New York.
North Creek, New York.
Norway, Maine.
Oak Orchard, New York.
Olcott, New York.
Palo Alto, California.
Paradox Lake, New York.
Patrick, Wyoming-Nebraska.
Polvo, Texas.
Port Harford, California.
Raleigh, West Virginia (resurvey).
Richmond, Kentucky.
Rico, Colorado.
Ridgeway, New York.
Rio Grande, Texas.
Roseburg, Oregon.
Ruidosa, Texas.
San Carlos, Texas.
San Jose, California.
San Luis Obispo, California.
Schroon Lake, New York.
Seattle, Washington.
Sebago, Maine.
Shafter, Texas.
Silverton, Colorado.
Sonora, California.
Spanish Peaks, Colorado (resurvey).
Standing Stone, Tennessee.
Strafford, Vermont.
Sun Prairie, Wisconsin.
Tacoma, Washington.
Tallapoosa, Georgia-Alabama.
Tamalpais, California.
Telluride, Colorado.
Tintic Special, Utah.
Tower, North Dakota.
Valentine, Texas.
Walsenburg, Colorado (resurvey).
Weiser, Idaho.
West Washington, D. C.-Maryland-Virginia.

The list of those which have progressed to publication is as follows:

Albany and vicinity, New York.
Anaheim, California.
Arapahoe, Nebraska-Kansas.
Bidwell Bar, California.
Boise, Idaho.
Bolton, New York.
Brackett, Texas.
Butte Special, Montana.
Cartersville, Georgia.
Casselton, North Dakota.
Castleton, Vermont-New York.
Chispa, Texas.
Cucamonga, California.
Dalton, Georgia-Tennessee (resurvey).
Downey, California.
Downieville, California.
Eagle, Wisconsin.
Eckelson, North Dakota.
Equinox, Vermont.
Fargo, North Dakota-Minnesota.
Fonda, New York.
Fort Davis, Texas.
Fremont, Nebraska.
Glens Falls, New York.
Holdrege, Nebraska.
Lake Placid, New York.
Las Bolsas, California.
London, Kentucky.
Los Angeles, California.
Marietta, Georgia.

Minneapolis, Minnesota.
Niagara Falls, New York.
Norway, Maine.
Oelrichs, South Dakota.
Osborne, Kansas.
Pawlet, Vermont.
Plainville, Kansas.
Polvo, Texas.
Pomona, California.
Red Cloud, Nebraska.
Redondo, California.
Richmond, Kentucky.
Rico, Colorado.
Rio Grande, Texas.
Roseburg, Oregon.
Ruidosa, Texas.
Russell, Kansas.
St. Paul, Minnesota.
San Bernardino, California
San Carlos, Texas.
San Pedro, California.
Santa Ana, California.
Santa Monica, California.
Sebago, Maine.
Silverton, Colorado.
Shafter, Texas.
Strafford, Vermont.
Stromsburg, Nebraska.
Tallapoosa, Georgia-Alabama.
Tamalpais, California.
Telluride, Colorado.
Tower, Colorado.
Valentine, Texas.

Throughout the year, as in previous years, Mr. Baker served as secretary of the United States Board on Geographic Names, although the greater portion of his time was given to the work of the Venezuelan Boundary Commission. He continued, however, to exercise a general supervision over the editing of the topographic maps of the Survey until the appointment of Mr. Willis as acting editor, in December.

DIVISION OF ENGRAVING AND PRINTING.

Mr. S. J. Kübel was continued in charge of this division as chief engraver, assisted by Mr. Henry C. Evans, foreman of copperplate engravers; Mr. Robert H. Payne, in charge of the transferring to stone; Mr. Joseph Eckert, in charge of the work of the lithographic power presses; and Mr. Oscar Schleichert, in charge of stone work. There were also employed 17 copperplate engravers, 4 lithographic engravers, and 35 printers.

The work of the division has been, as in previous years, devoted to the engraving and printing of topographic maps and geologic folios. In addition to the reproductive processes heretofore employed, a branch for photolithographic and photo-engraving work has recently been introduced. The most important work of this kind has been the production of photolithographic copies of land plats of the Indian Territory. Extended use has also been made of the process in the preparation of special topographic maps for the topographers and others. The introduction of this plant has proved to be successful and economical.

Topographic sheets.—New sheets to the number of 60 were engraved complete, distributed by States as follows: California, 13; Colorado, 7; Georgia, 1; Maine, 2; Montana, 1; Nebraska, 5; New York, 9; North Dakota, 4; Oregon, 1; South Dakota, 1; Texas, 8; Washington, 1; Vermont, 3; West Virginia, 2; Wyoming, 2. At the close of the fiscal year there were in the engravers' hands 24 sheets.

Of the standard topographic atlas sheets 128,983 were printed and delivered, an increase of 49,248 over the output of the previous year. Of special maps there were printed the following: Mount Washington and vicinity forestry map, 108 copies; hypsometric map of the United States, 700; small contour map of the United States, 115; magnetic declination map, 1,050; special Albany and vicinity map, 2,000; township plats of Indian Territory, 1,680; township exterior maps of Indian Territory, 20; proofs on drawing paper for use of topographers, 267. Besides, there were printed, in connection with the editing and distributing of the topographic maps and geologic folios, a large number of cards, etc.

In printing editions of old sheets considerable revision is made upon each of the copper plates, and this involves no little expenditure of time on the part of the engravers.

Geologic folios.—Lists of the geologic folios published during the year and those in an advanced stage have been given under the heading "Geologic maps" (pp. 120–122). These show that 9 folios were completed and that 15 more are nearing completion.

The editions of the geologic folios completed and delivered during the year reach a total of 54,203 copies. As the Nevada City was a double folio and the Yellowstone Park was equivalent to 3 of the single folios, the number of single folios printed and delivered was equal to 12. The total number of folios issued is 11,654 less than for the previous year, but this apparent difference disappears when the extra work connected with the publication of the Nevada City and Yellowstone Park folios is taken into consideration.

As in previous years, Mr. Kübel has devoted a great deal of energy to raising the standard of excellence along all lines of work with which his division is charged. In this connection the Director accompanied him to Boston to examine into the process of color printing, and it is believed that within a year or two great progress will have been made in this work.

ADMINISTRATIVE BRANCH.

DIVISION OF DOCUMENTS, CORRESPONDENCE, AND RECORDS.

This division was continued in general charge of the chief clerk, Col. H. C. Rizer, the custody and distribution of the documents and stationery being under the immediate charge of Dr. W. D. Wirt, and the files and records of correspondence and appointments in charge of Miss Annie L. Arnold until the return of Mr. John R. Walsh, in April.

DOCUMENTS AND STATIONERY.

The distribution of documents during the year has increased somewhat over that of last year, 126,135 volumes, 30,417 geologic folios, and 101,974 maps having been sent out. The postal authorities handled this large amount of material promptly and without the loss of a single important piece. The distribution of the surplus of the office edition of the topographic maps was continued as in previous years until after the passage of the law authorizing the sale of the same at cost and ten per centum added.

The publications received and distributed were Part I of the Sixteenth Annual Report and separates therefrom; Parts I, II, III, and III (continued) of the Seventeenth Annual Report and separates from the same; Bulletins Nos. 127, 130, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, and 148; Monographs XXV, XXVI, XXVII, and XXVIII; Water-Supply and Irrigation Paper No. 1; Geologic Folios 26, 27, 28, 29, 30, 31, 32, 35; and 168 separate map sheets, including reissues.

The proceeds from the sale of publications amounted to $1,756.07, of which $505.77 was received for topographic maps. This is an increase over the sales of the previous year, owing largely to the placing of prices upon topographic maps.

It will be realized that the labor consequent on the distribution of documents is large when it is considered that every document sent out is properly charged, and that in the distribution of documents the wants of every applicant are carefully considered.

During the year 340 requisitions for stationery and supplies were made upon the Department, and about 2,797 office requisitions were filled. Letters relating to documents, stationery, etc., to the number of 25,921 were received and 22,637 sent out.

CORRESPONDENCE AND RECORDS.

The register of general correspondence shows that 4,300 letters were briefed and indexed. These were referred or otherwise appropriately disposed of. The record of letters sent shows an aggregate of 3,700 pages of type-written matter to have been press-copied. In addition to the care of the records of correspondence, the work embraced the records of appointments and other changes in the force and leaves of absence and attendance. The appointment records show that appointments and other changes were made during the year as follows: original appointments, 33; appointments authorized by the Secretary, 27; promotions, 73; reductions, 2; resignations and dismissals, 24; transfers to other bureaus, 9; reinstatements, 4.

THE LIBRARY.

The library of the Survey was continued under the charge of Mr. Charles C. Darwin, assisted by Miss Julia L. McCord, Miss M. E. Latimer, and Mr. Thomas K. Gallaher.

Its total contents in books, pamphlets, and maps has increased to 133,137 through accessions during the year of 2,772 books, 2,600 pamphlets, and 480 maps. Of these, 2,413 books, 2,500 pamphlets, and 480 maps were received as the result of exchange.

The growth of the library for the year is shown in detail in the following table:

Contents of the library June 30, 1897.

BOOKS.			
On hand June 30, 1896:			
Received by exchange	27,268		
Received by purchase	10,872		
		38,140	
Received during the past year:			
By exchange	2,413		
By purchase	359		
		2,772	
			40,912
PAMPHLETS.			
On hand June 30, 1896:			
Received by exchange	49,579		
Received by purchase	12,961		
		62,540	
Received during the past year:			
By exchange	2,500		
By purchase	100		
		2,600	
			65,140
MAPS.			
Geologic and topographic maps:			
On hand June 30, 1896		26,605	
Received during the year		480	
			27,085
Total number of books, pamphlets, and maps			133,137

There are no considerable arrears of work. The author catalogue is complete, all accessions are carded to date, and the great pamphlet collection purchased last year has been properly entered.

DIVISION OF DISBURSEMENTS AND ACCOUNTS.

This division remained in charge of Mr. John D. McChesney, chief disbursing clerk, throughout the year. A summarized statement of disbursements follows, and a detailed statement will appear in pamphlet form.

FINANCIAL STATEMENT.

Amounts appropriated for and expended by the United States Geological Survey for the fiscal year ending June 30, 1897.

	Expenses Geological Survey, 1897.	Expenses Geological Survey, 1896 and 1897.	Surveying lands, Indian Territory, 1896 and 1897.	Engraving and printing the geological maps of the U. S., 1897.	Salaries, office of Geological Survey, 1897.	Total.
Appropriations 1896 and 1897, and 1897—Acts approved May 28, 1896; June 10, 1896; June 11, 1896; and from other sources	$154,500.15	$275,000.00	$200,000.00	$60,141.65	$31,390.00	$721,031.80
Amounts expended, classified as follows:						
A. Services	122,143.92	186,637.66	130,300.87	48,802.74	31,281.32	519,166.01
B. Traveling expenses	6,673.35	16,335.98	1,103.19	130.30	....	24,242.82
C. Transportation of property	565.00	3,719.89	1,066.14	28.73	....	5,379.76
D. Field subsistence	2,464.69	20,099.84	31,645.41	....	....	54,209.94
E. Field supplies and expenses	3,874.68	28,118.11	21,904.21	....	....	53,897.00
F. Field material	309.31	4,710.57	7,933.94	....	....	12,953.82
G. Instruments	656.89	5,016.85	4,449.10	....	....	10,122.84
H. Laboratory material	1,009.64	....	....	....	....	1,009.64
I. Photographic material	1,670.27	727.47	....	....	....	2,397.74
K. Books and maps	1,659.59	18.25	....	....	....	1,677.84
L. Stationery and drawing material	451.52	678.21	916.18	....	....	2,045.91
M. Illustrations for reports	767.50	10.26	....	....	....	777.76
N. Office rents	4,199.88	....	....	....	....	4,199.88
O. Office furniture	194.70	479.90	129.00	120.81	....	924.41
P. Office supplies and repairs	639.46	1,245.91	250.50	251.62	....	2,387.49
Q. Storage	....	293.16	167.85	....	....	461.01
R. Correspondence	5.81	79.01	14.47	....	....	99.29
S. Materials for engraving and printing maps	....	....	....	6,375.37	....	6,375.37
T. Railroad accounts settled at U. S. Treasury:						
Passenger	667.91	2,371.02	....	....	....	3,038.93
Freight	15.45	599.26	....	....	....	614.71
Total expenditures	147,969.57	271,141.35	199,880.36	55,709.57	31.281.32	705,982.17
Balance unexpended July 1, 1897	6,530.58	3,858.65	119.64	4,432.08	108.68	15,049.63
Probable amount required to meet outstanding liabilities	6,530.58	3,858.65	119.64	4,432.08	2.56	14,943.51

ANALYSIS OF DISBURSEMENTS.

Under the following heads appear the total expenditures under the various appropriations:

1. Salaries, office of Geological Survey	$31,281.32
2. Salaries of scientific assistants	29,900.00
3. Skilled laborers, and various temporary employees	12,993.37
4. Topography	173,354.68
5. Geology	97,786.67
6. Paleontology	9,885.85
7. Chemical and physical researches	6,922.09
8. Preparation of illustrations	12,885.41
9. Mineral resources of the United States	19,877.55
10. Books for library, etc	1,512.49
11. Gauging streams, etc	44,796.93
12. Rent of office rooms	4,199.88
13. Coal and gold resources of Alaska	4,996.00
14. Engraving and printing geological maps of the United States	55,709.57
15. Surveying lands in the Indian Territory	199,880.36
Total	705,982.17

APPENDIX TO EIGHTEENTH ANNUAL REPORT OF THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY.

TRIANGULATION AND SPIRIT LEVELING.

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APPENDIX TO DIRECTOR'S REPORT: TRIANGULATION AND SPIRIT LEVELING.

The data included in this Appendix have been assembled for publication by Messrs. H. M. Wilson, J. H. Renshawe, E. M. Douglas, and R. U. Goode, chiefs of the Atlantic, Central, Rocky Mountain, and Pacific sections of topography.

TRIANGULATION.

The topographic work rendered necessary the establishment of six astronomic stations and the measurement of four base lines. Triangulation stations to the number of 160 were occupied, and 970 miles of primary traverses were run. The distribution of the work is shown on Pl. II, in pocket. The geographic positions derived from this work are given on the following pages. A few positions determined in former years and not heretofore published are included.

ASTRONOMIC WORK.

The method adopted for all astronomic determinations of latitude is that known as the "Talcott" or "double zenith distance" method. Pairs of stars were selected from Safford's Catalogue of 2,018 Stars, though whenever possible the positions of such stars were obtained from the Berliner Astronomisches Jahrbuch.

Longitudes were determined by the telegraphic method, the reference or base stations used being the United States Coast and Geodetic Survey observatory at Lafayette Park, San Francisco, or the Washington observatory at St. Louis, Missouri. The observer at the former station was Mr. Fremont Morse, of the United States Coast and Geodetic Survey, and at the latter Prof. H. S. Pritchett and Mr. A. Ramel. Mr. S. S. Gannett was the observer at all field stations.

The adopted longitudes west of Greenwich of the reference stations are:

Lafayette Park observatory, 8^h, 09^m, $42^s.770$.

Washington observatory, 6^h, 00^m, $49^s.168$.

The latter position is that for the pier used since 1890, which is $0^s.005$ west of the old pier.

In the time determinations and clock comparisons for longitude work the following programme was adhered to as closely as possible:

1. Observations of four to six time and one or more azimuth stars, with at least four sets of level readings.

2. Reversal of transit.
3. Observations of four to six time and one or more azimuth stars, with at least four sets of level readings.
4. Exchange of arbitrary signals.
5, 6, 7, Repetition of 1, 2, 3.

Care was taken to have the time stars so selected that the sum of the azimuth and collimation factors of each complete set should approximate to zero, hence the resulting clock corrections were subject to but slight modification from instrumental errors. The right ascensions used were taken either directly from the Berliner Jahrbuch or from the American Ephemeris and reduced to the Jahrbuch system.

Observations for personal equation were made either preceding or immediately after the observations in the field.

The field instruments used were two break-circuit sidereal chronometers (No. 187, by Bond & Sons, and No. 353, by Blunt & Nichols), a chronograph by Fauth & Co., and a combined meridian and zenith telescope (No. 354, by Fauth & Co.)

The piers for the support of the meridian transit at all field stations are of one general pattern, and consist of a foundation of a cubic yard of Portland cement concrete, with its upper surface level with the surface of the ground. On this a solid column of cemented brickwork, 2 by 2½ brick-lengths in cross section and 3 feet in height, is built, which is capped by a dressed stone measuring 8 by 20 by 24 inches.

BASE LINES.

Each of the base lines was measured with a 300-foot steel tape along a railroad tangent, such a location affording admirable opportunities for rapid work without the difficulty and expense of preparing and aligning supports for the tape. The lengths of the lines vary from 4 to 5 miles, and measurements were made at night or during light rains, to avoid so far as possible errors in determining temperature. All lines were prepared in advance by nailing to the railway ties strips of pine about 4 feet in length by 6 inches in width. On these were tacked strips of sheet zinc 1 by 4 inches in size. The 300-foot marks were scratched on the zinc with a sharp-pointed knife as each tape length was laid off. Temperature was taken by two thermometers at each tape length. The length of each tape was determined by comparisons with the United States Coast and Geodetic Survey standard in Washington, D. C.

TRIANGULATION.

During the year definite rules were fixed for the conduct of primary triangulation. A maximum permissible error for triangle closures was adopted and the character of the signals and kinds of station marks were settled on. These and many other details which had heretofore been left to the judgment of each individual observer were made uniform and their adoption was insisted upon. No work is now classed as primary that is not executed with first-class micrometer instruments. Of these the Survey now has 11, 10 by Fauth & Co. having $7\frac{5}{8}$-inch graduated circles reading by two micrometers to $2''$, while the other has a 11-inch Gambey circle also reading to $2''$ by two micrometers. The Survey also owns 2 Kübel theodolites, reading by vernier to $10''$. These are now used only for secondary work.

The general type of surface signals used is a tripod of 2 by 4 inch timber, supporting a central 4 by 4 inch pole, on which are nailed rectangular targets varying in size from about 18 inches to 3 feet each in length and breadth. The targets and upper parts of tripods are covered with horizontal strips of black and white cloth.

Forests and smoke were the worst obstacles encountered. To avoid the former, observing scaffolds from 10 to 75 feet in height were built, of sawed timber, each having an interior tripod, entirely separate from the platform, for the support of the theodolite.

When angles were being read, the theodolite, carefully plumbed over center of station, was sheltered from the wind and sun by large pieces of cloth spread over the tripod signal or over the observing platform.

To smoky or hazy atmosphere is due the large average closure error of some of the results given.

PRIMARY TRAVERSE.

In areas where, because of lack of relief in the topography, the cost of erecting signals or observing platforms for triangulation stations would be excessive, primary control is obtained from traverse lines run with transit and 300-foot steel tape. They are generally along railroads, and they give control sufficiently accurate for mapping, at a small cost. They start and end either at an astronomic or a triangulation station.

In the office computations for triangulation, local or station adjustments were generally made by distributing the errors in proportion to the number of observations. For figures, the adjustments were made by the method of least squares.

Metric measures were used for all distance computation, and United States Coast and Geodetic Survey factors for computation of coordinates.

The following instructions for triangulation and primary traverse were generally in use during the field season, although not formally adopted until after its close:

INSTRUCTIONS FOR FIELD WORK OF PRIMARY TRIANGULATION.

1. Signals should be of sawed lumber whenever it can be obtained, and great care must be taken to secure perfect centering of instrument and target over station mark.

2. All stations should be selected with a view to their adaptability to topographic expansion, and when the exact location of a station is decided upon one of the stand-

ard iron posts, copper plugs, or bronze tablets must be set as a permanent mark. In light soil a bottle or similar object must be left as a sub-surface mark. These marks should be at exact center of station, and in addition there should be left one or more reference marks. At base-line stations there should be left at least two reference marks.

3. Whenever practicable, set the theodolite over center of station while reading angles, to obviate reduction to center.

4. The theodolite when in use must be sheltered from the sun and wind. When setting the theodolite tripod, leave the head-bolt thumb-screws loose until the legs are firmly placed.

5. Never, under any circumstances, attempt to place the circle so that when pointing at any particular station the micrometers will be set to even degrees.

6. Use book No. 9–912 for all field records, and do not crowd notes. Have notes plainly written with No. 4 pencil or with ink, and never erase, but draw a single line through erroneous records.

7. On page immediately preceding record of angles, write a minute and complete description of the station occupied, giving nearest trails or roads, camping places, station marks, etc., as well as ownership of land when possible. Write this description before leaving the station. In addition plat a rough diagram of pointings, showing also plan of eccentric location of instrument, if there be such.

8. Before observations are commenced at a station, test all adjustments of theodolite, and correct such as are found in error, paying special attention to micrometers to avoid the errors of run.

9. For micrometer theodolites, angles must be measured either by the method of circle readings (directions) or by single angles, and in either case each set of angles must be kept on a single page of note-book. If the method of directions be adopted, each complete set must consist of pointings with telescope direct, and reverse pointings with telescope inverted, always closing horizon. See U. S. G. S. Monograph XXII for additional details in use of micrometer theodolites.

10. No angle should be considered finally determined that has not been measured on at least four different parts of the circle.

11. The error of closure of any triangle in primary schemes should not exceed 5″.

12. Opposite each angle recorded give any necessary information in regard to visibility of signals or atmospheric conditions.

13. Do not trust to memory for notes. Make all notes as complete as though it were expected another person would compute them.

14. Magnetic declination must be determined at each azimuth station and at each county seat.

15. Observations for azimuth on Polaris before and after elongation must be made on two nights from at least one station in each square degree, to consist of not less than 6 angles between mark and star with telescope direct and reversed. See Monograph above referred to for form of record. Great care must be taken in adjusting and leveling the horizontal axis of theodolite. Watch error must be determined by telegraphic comparison of time or by astronomic observations.

16. Two marks of dressed stone or masonry, about 500 feet apart on a true north-and-south line, must be established at each county seat, the center of each to be the cross mark on one of the standard bronze tablets.

17. Angles at each station must be reduced to center of permanent mark in order to test triangle closures. Arbitrary adjustments and preliminary computations should be made in the field. All computations except distances and coordinates must be in book No. 9–889.

18. Keep a careful plot of work on a scale of 10 miles to an inch, and each month send a copy with monthly report, indicating angles measured by the usual signs.

19. On fly-leaf of each notebook write an index of contents of book, and state make and number of theodolite used.

20. The observer should always endeavor to locate prominent points that may be of use to the topographer, or that may be used for future stations.

21. Especial attention must be paid to the location of county court-houses, section and county corners, and State-line marks.

22. Useful locations can often be made by the "three-point method," the theodolite being set up for the purpose while going to or from stations.

23. Keep in view the fact that station names are to be published, and select such as have local significance.

INSTRUCTIONS FOR PRIMARY TRAVERSE.

1. The instruments to be used are a 20″ or 30″ transit, one 300-foot steel tape graduated to feet for 5 feet at either end, one spring balance, one 100-foot steel tape, two thermometers, four hand recorders, two flag poles, and one good watch.

2. The party should consist of: One chief, as transitman; one recorder; two tapemen, either of whom may act as front or rear flagman; and one flagman.

3. At each station the transitman should proceed as follows: Set telescope on rear flag, read both verniers, transit telescope, set on front flag, and read both verniers. Shift the circle and remeasure the same angle with telescope reversed. If the two angles thus measured differ more than 60″, repeat the operation.

4. Along a railroad the operation of measuring is to be conducted as follows: The front tapeman puts a 20-pound tension on the front end of the 300-foot tape with a spring balance. He makes a chalk mark on the rail, or places a tack or nail on a tie, stake, or measuring board, under the 300-foot mark for full tape lengths, and under the fractional graduation at stations. The distance which he records is checked by the transitman and at least one other member of the party. The tack or nail is left, surrounded by conspicuous chalk marks, and the same process is continued.

5. The rails should be counted by two others of the party, who also check the number of tape lengths at the first opportunity. Each station should be marked by a small-headed tack or pricking-needle through a piece of white paper or cloth, its number being chalked on the rail near where it falls. The distance between stations should be limited to the visibility of the flag poles. Rails or center of track must not be used as alignment sights.

6. Along highways or open country the tape should be kept level. On steep slopes a plumb-bob must be used, either to bring the tape vertically over an established point or to establish a new one, as the case may be. Tape lengths are marked on the measuring board, tie, or stake with the pricking-needle. Where slopes are so steep as to render the leveling of the 300-foot tape impracticable, a shorter tape must be used.

7. The chief and two other members of the party must keep an independent count of tape lengths. The temperature of the tape must be taken every hour in the day. Stations should be made at even tape lengths whenever practicable.

8. Observations for azimuth must be made at close of each day's work when possible, and azimuth stations should not be more than 10 miles apart, except on long tangents.

9. An azimuth observation must consist of not less than three direct and three reverse measures on three parts of the circle between Polaris and an azimuth mark, to be made at any hour, but preferably near elongation, and the place, date, time, and watch error should be recorded.

10. The watch should be compared with standard time often enough to determine its error within ten seconds.

11. Where the line traversed is very crooked, the instrument should be fitted for observation of solar azimuths, and these should be made at least twice in each day, weather permitting, in addition to Polaris observations.

12. The record must contain a description of the starting point of the line and the beginning and ending of each day's work; also, location of each railroad station,

milepost, and switch passed, and wagon road, stream, land or county line crossed, and connection with corners of the public-land surveys.

13. Two permanent marks, either the copper bolts or the standard bronze tablets of the Survey, should be placed not less than 500 feet apart at the beginning and end of each line; also at prominent junction points from which other primary control lines may be started. A complete description and detailed sketch of these should be entered in the notebook.

14. Permanent marks of some kind should be left at such points passed during cloudy or unfavorable weather as it may be necessary to return to for the observation of azimuths.

15. Meridian marks, consisting of two of the standard bronze tablets let into dressed stone or masonry posts and placed 500 feet or more apart, must be established at each county seat passed in the progress of the work.

16. Observations for magnetic declination must be made at several points in the course of a season's work, especially at county seats.

17. A complete record must be kept by the transitman in book No. 9-905, and a separate record of tape lengths by the front tapeman.

18. The transit notes should be entered and worked up in the following manner:

Station.	Pointings: Back and transited.		Mean pointing.	Deflection angle.	Comp. az.	Remarks.
	Ver. A.	Ver. B.				
	° ′ ″	° ′ ″	° ′ ″	° ′ ″		
392	65 48 00	245 48 00	65 48 00	0 46 00	....	11 a. m. 72°.
	65 02 00	245 02 00	65 02 00			
100 rails.			65 02 00	0 46 00	....	76 road crossing.
2,975 feet.	64 16 00	244 16 00	64 16 00			
				0 46 00	....	
393	64 16 00	244 16 00	64 16 00	4 41 30	....	12 m. 73°.
	68 57 30	248 57 30	68 57 30			
39 rails.			68 57 30	4 41 30	....	On road crossing.
1,197 feet.	73 39 00	253 39 00	73 39 00			
				4 41 30	....	

DESCRIPTION AND POSITIONS OF STATIONS, ARRANGED BY STATES.

NEW YORK.

Primary triangulation for the Adirondack region is based on the geodetic coordinates of the stations Hamilton-Prospect, as given by the United States Coast and Geodetic Survey. That for southwestern New York is based on the geodetic positions of Harrison, Orange, and Swale, as given by the New York State Survey (Gardiner). A least-square figure adjustment has been made of the work in the former region, and an arbitrary adjustment of the triangulation in the latter region, which consisted of a belt of single triangles. The field observations were made by Mr. W. J. Peters. Average closure error of triangles is 4″.7.

HAMILTON, IN HAMILTON COUNTY.

United States Coast and Geodetic Survey triangulation station on highest point of Mount Hamilton, 3 miles southeast of Lake Pleasant, Hamilton County. Cleared of timber.

Station mark: Copper bolt set in solid rock, marked "U. S. G. S. 465 N. Y."

[Latitude, 43° 24′ 41″.82. Longitude, 74° 22′ 00″.14.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Prospect	268 28 38.73	88 53 20.26	4.6858085
Gore	221 33 38.32	41 46 44.82	4.5860772
Crane	245 28 19.04	65 44 59.34	4.5547813
Big Range	206 09 35.82	26 14 31.60	4.3397301
Snowy	177 03 15.52	357 02 24.76	4.5065186

PROSPECT, IN WARREN COUNTY.

A triangulation station of the United States Coast and Geodetic Survey on the summit of Prospect Mountain, in Warrensburg Township, Warren County, about 5 miles by road southwest of Caldwell. The summit is covered with a second growth of timber about 20 feet high.

Station mark: A dressed granite stone 6 by 6 by 30 inches.

Reference marks: Four dressed stones, 10 feet distant in direction of cardinal points.

[Latitude, 43° 25′ 17″.94. Longitude, 73° 46 04″.56.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hamilton	88 53 20.26	268 28 38.73	4.6858085
Gore	140 40 21.78	320 28 43.29	4.5543688

GORE, IN WARREN COUNTY.

A flat-topped mountain, about 2½ miles southwest of North Creek, in the northwest corner of Warren County. The station is on a bare rock near south end of summit. The summit has been cleared at one time, but there is now a second growth.

Station mark: A copper bolt set in solid rock, marked "U. S. G. S. 468 N. Y."

[Latitude, 43° 40′ 15″.01. Longitude, 74° 02′ 58″.43.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Snowy	96 56 33.20	276 42 33.72	4.4380049
Crane	333 23 14.45	153 26 49.68	4.1942257
Big Range	60 09 30.24	240 01 18.95	4.2651735
Blue	128 27 41.19	308 13 04.92	4.5577342

CRANE, IN WARREN COUNTY.

A rocky, bare summit in Warren County, about 3 miles northwest of Thurman post-office.

Station mark: Copper bolt set in solid rock, marked "U. S. G. S. 464 N. Y."

[Latitude, 43° 32′ 41″.82. Longitude, 73° 57′ 46″.36.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hamilton	65 44 59.34	245 28 19.04	4.5547813
Big Range	101 54 15.19	281 42 29.42	4.3706811
Prospect	310 54 38.04	131 02 40.98	4.3199370
Snowy	116 52 24.04	296 44 50.26	4.5836926

BIG RANGE, IN HAMILTON COUNTY.

The most northern peak of three timbered points known as Big Range, in Hamilton County, between the East Branch of Sacandaga River and Jessups River.

Station mark: Copper bolt set in solid rock, marked "U.S.G.S. 466 N. Y."

[Latitude, 43° 35′ 17″.48. Longitude, 74° 14′ 50″.45.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Crane	281 42 29.42	101 54 15.19	4.3706811
Gore	240 01 18.95	60 09 30.24	4.2651735
Snowy	137 50 44.87	317 44 57.45	4.2251617

SNOWY, IN HAMILTON COUNTY.

A bare rock-capped mountain in Hamilton County, about 8 miles southwest of Indian Lake post-office.

Station mark: A copper bolt set in solid rock, marked "U. S. G. S. 469 N. Y."

[Latitude, 43° 42′ 00″.60. Longitude, 74° 23′ 13″.81.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Gore	276 42 33.72	96 56 33.20	4.4380049
Big Range	317 44 57.45	137 50 44.87	4.2251617
Blue	176 34 39.02	356 34 03.53	4.2828778
Vander Whacker	226 39 21.67	46 51 26.23	4.5068594

BLUE, IN HAMILTON COUNTY.

A rock-capped summit in Hamilton County, about 3 miles from "Blue Mountain" village. The summit has been cleared.

Station mark: A copper bolt set in solid rock, marked "U. S. G. S. 470 N. Y."

[Latitude, 43° 58′ 20″.98. Longitude, 74° 24′ 05″.10.

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Snowy	356 34 03.53	176 34 39.02	4.2828778
Gore	308 13 04.92	128 27 41.19	4.5577342
Vander Whacker	263 14 00.45	83 26 41.71	4.3923451

VANDER WHACKER, IN ESSEX COUNTY.

A rock-capped summit in the southwestern part of Essex County, between North or Hudson River, Boreas River, and the stage road from Aiden Lair to Newcomb. The summit has been cleared.

Station mark: A copper bolt set in solid rock, marked "U. S. G. S. 471 N. Y."

[Latitude, 43° 53′ 53″.73. Longitude, 74° 05′ 46″.97.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Blue	83 26 41.71	263 14 00.45	4.3923451
Snowy	46 51 26.23	226 39 21.67	4.5068594
Gore	351 30 01.50	171 31 58.13	4.4073506

SWALE, IN STEUBEN COUNTY.

In lot No. 429, Steuben County, on property of Mr. Burlingame, about 4 miles east of West Cameron, on bare hill.

Station mark: Granite post, marked "429 N. Y. S. S."

[Latitude, 42° 12′ 16″.23. Longitude, 77° 29′ 28″.02.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Harrison	28 11 28.77	208 03 10.47	4.5597210
Call	93 17 16.4	273 10 27.2	4.1459946

CALL, IN STEUBEN COUNTY.

Eastern end of long summit known as Call Hill or East Call Hill, in Hartsville Township, Steuben County, about 100 yards south of road from Alfred Center to Bennett Creek post-office, and about 3 miles distant from the latter.

Station mark: An iron post with brass cap marked "U. S. Geological Survey B. M. U. S. G. S. 473 N. Y."

[Latitude, 42° 12′ 41″.80. Longitude, 77° 39′ 37″.16.

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Swale	273 10 27.2	93 17 16.4	4.1459946
Alma	58 25 50.1	238 11 39.8	4.5341817
Ward	101 20 46.0	281 12 21.9	4.2440196
Round Top	56 49 31.0	236 42 19.0	4.2470200

ALMA, IN ALLEGANY COUNTY.

In lot 127, Alma Township, Allegany County, about 1½ miles east of Pikeville post-office, on property of Mr. Hall, of Wellsville. Cleared toward east; heavily timbered toward west.

Station mark: Iron post with brass cap marked "U. S. Geological Survey B. M. U. S. G. S. 475 N. Y."

[Latitude, 42° 02′ 59″.33. Longitude, 78° 00′ 44″.68.

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ward	208 59 28.9	29 05 16.1	4.3887799
Belfast	148 24 04.9	328 17 14.0	4.4278990
Clarksville	110 50 59.8	290 43 32.8	4.2148842
Round Top	239 53 56.0	60 00 54.0	4.2191200

WARD, IN ALLEGANY COUNTY.

On divide between headwaters of Vandermark and Phillips creeks, about 1½ miles southeast of Phillips Creek post-office, in lot 29, Ward Township, Allegany County, on property occupied by Mr. A. W. Lamphear.

Station mark: Iron post with brass cap marked "U. S. Geological Survey B. M. U. S. G. S. 472 N. Y."

[Latitude, 42° 14′ 32″.95. Longitude, 77° 52′ 07″.21.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Alma	29 05 16.1	208 59 28.9	4.3887799
Call	281 12 21.9	101 20 46.0	4.2440196
Belfast	93 11 53.2	272 59 13.6	4.4139140
Round Top	349 26 39.0	169 27 50.0	4.1249400

BELFAST, IN ALLEGANY COUNTY.

In lot 10, Belfast Township, Allegany County, about 8 feet north of road from Black Creek to Transit Bridge, about 2 miles east of Black Creek post-office, and about 4 miles northwest of Friendship.

Station mark: A copper bolt set in granite post 4 feet long by 6 inches square, marked "U. S. G. S. 477 N. Y."

[Latitude, 42° 15′ 18″.30. Longitude, 78° 10′ 56″.94.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Alma	328 17 14.0	148 24 04.9	4.4278990
Ward	272 59 13.6	93 11 53.2	4.4139140
Clarksville	4 14 26.8	184 13 50.0	4.2311053
Learn	84 30 35.9	264 20 32.9	4.3151033

CLARKSVILLE, IN ALLEGANY COUNTY.

A partially cleared hill about 3 miles southeast of Clarksville, 3 miles northwest of Bolivar, and 3 miles west of Richburg, in lot 2, Clarksville Township, Allegany County.

Station mark: A copper bolt set in granite post 4 feet long by 6 inches square, marked "U. S. G. S. 476 N. Y."

[Latitude, 42° 06′ 08″.00. Longitude, 78° 11′ 51″.74.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Alma	290 43 32.8	110 50 59.8	4.2148842
Belfast	184 13 50.0	4 14 26.8	4.2311053
Learn	127 50 30.6	307 41 05.3	4.3882626

LEARN, IN CATTARAUGUS COUNTY.

In township of Ischua, Cattaraugus County, on property of Mr. Learn, 3 miles west of Bennett Creek post-office.

Station mark: A copper bolt set in granite post 4 feet long, marked "U. S. G. S. 478 N. Y."

[Latitude, 42° 14′ 13″.27. Longitude, 78° 25′ 53″.79.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Clarksville	307 41 05.3	127 50 30.6	4.3882626
Belfast	264 20 32.9	84 30 35.9	4.3151033

ROUND TOP, IN ALLEGANY COUNTY (not occupied).

Secondary point. In lot 28, Andover Township, Allegany County, on property of Mr. Sullivan, 3 miles southwest of Andover. A cleared point.

Station mark: Iron post with brass cap marked "U. S. Geological Survey B. M. U. S. G. S. 474, N. Y."

[Latitude, 42° 07′ 28″.11. Longitude, 77° 50′ 20″.78.]

Station.	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters*
Harrison	333 05 15.0	153 10 49.0	4.41344
Call	236 42 19.0	56 49 31.0	4.24702
Alma	60 00 54.0	239 53 56.0	4.21917
Ward	169 27 50.0	349 26 39.0	4.12494

PENNSYLVANIA.

HARRISON, IN POTTER COUNTY.

In the northeastern part of Potter County, Pa., about 3 miles west of Harrison Valley. Hill cleared toward north and west.

Station mark: A granite post marked "228 N. Y. S. S."

[Latitude, 41° 54′ 59″.04. Longitude, 77° 41′ 51″.84.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Swale	208 03 10.5	28 11 28.8	4.5597210
Call	185 22 56.9	5 24 27.1	4.5176669
Alma	119 42 40.0	299 30 02.2	4.4770492
Round Top	153 10 49.0	333 05 15.0	4.4134400

ALABAMA.

TUSCALOOSA ASTRONOMIC STATION.

The pier of this station is located on the grounds of the observatory connected with the State University, 85 feet south of the meridian circle.

The computed latitude is 33° 12′ 35″.91; probable error, ± 0″.18; longitude, 87° 32′ 56″.14; probable error, ± 0″.66.

TENNESSEE.

PRIMARY RAILROAD TRAVERSE.

The following geographic positions were determined by Mr. Gilbert Thompson from primary railroad traverse, starting from Columbia and running northward over the Louisville and Nashville Railroad to Brentwood triangulation station:

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Columbia (Reservoir Hill)	35 36 50.7	87 02 39.5
Columbia (junction Louisville and Nashville and Nashville and Chattanooga railroads)	35 36 13.0	87 02 09.6
Columbia (Y junction Louisville and Nashville Railroad to Florence)	35 36 28.2	87 03 04.4
Columbia (Y junction Louisville and Nashville Railroad to Florence)	35 36 33.8	87 03 12.8
Goodwin depot	35 38 46.5	87 02 47.4
Darko Mill depot	35 40 36.3	87 00 40.1
Carters Creek depot	35 42 50.5	86 59 38.7
Cleburne depot	35 44 12.7	86 58 16.5
Ewell depot	35 45 27.1	86 56 23.1
Thompson Station depot	35 47 48.1	86 54 26.3
Plug in rock (near spring on Ridley farm)	35 48 57.1	86 53 49.2
West Harpeth depot	35 50 20.3	86 53 59.0
Nashville pike	35 52 18.7	86 52 55.4
Franklin depot	35 55 08.8	86 51 51.2
Mallory crossroads	35 57 07.9	86 49 52.9
Callender depot	35 59 22.8	86 48 05.9
Brentwood (south copper bolt)	36 02 01.4	86 47 07.2
Brentwood triangulation station	36 02 14.7	86 46 49.0

The following geographic positions were determined by Mr. W. J. Peters from primary railroad traverse, starting from Brentwood on Louisville and Nashville Railroad, across country to Nashville, Chattanooga and St. Louis Railway, thence west on main line to Johnsonville:

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Brentwood triangulation station	36 02 14.7	86 46 49.0
South copper bolt, Brentwood	36 02 01.4	86 47 07.2
County crossroads	36 02 13.4	86 49 10.2
9-mile stone on Nashville pike	36 02 51.0	86 51 47.0
Belleview depot	36 03 51.6	86 56 21.2
Newsom depot	36 04 48.4	86 59 54.4
Road crossing between Belleview and Pegram	36 05 46.4	87 02 09.3
Pegram's house, northeast corner	36 05 59.1	87 03 05.3
Kingstons Springs depot, northeast corner	36 06 08.0	87 06 57.8
Craggie Hope	36 05 43.1	87 09 03.3
Craggie Hope and White Bluff, road crossing between	36 06 01.6	87 12 03.3

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
White Bluff depot	36 06 18.0	87 13 13.5
Burns depot	36 03 19.4	87 18 58.9
Road crossing	36 03 46.7	87 20 28.1
Dickson depot	36 04 32.4	87 23 23.7
Road crossing	36 06 01.0	87 27 59.5
Tennessee City depot	36 05 33.7	87 31 02.1
Road crossing	36 06 18.2	87 34 00.3
McEwen depot	36 06 37.0	87 38 06.8
Briggs depot	36 06 25.8	87 41 06.3
Gorman depot	36 06 17.6	87 42 37.5
Road crossing	36 05 11.0	87 45 30.9
Waverly depot	36 05 14.9	87 47 31.5
Frank depot	36 04 09.6	87 53 00.2
Box depot, northwest corner	36 02 58.8	87 55 27.3
Johnsonville depot	36 03 58.6	87 57 53.9
United States Engineer Corps bench mark on railroad bridge over Tennessee River	36 04 07.7	87 58 01.1

The following geographic positions were determined by Mr. W. J. Peters from primary railroad traverse, starting from Dickson Junction of the Nashville, Chattanooga and St. Louis Railway, and running south on the Centerville Branch to its terminus:

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Tidwell, switch block	36 00 43.5	87 20 08.2
Iron Hill, store	35 59 21.5	87 19 28.4
Bon Aqua depot	35 57 13.1	87 19 45.0
Lyles depot	35 55 14.6	87 20 50.5
Graham depot, northeast corner	35 52 30.6	87 27 48.4
Nunnelly depot, northwest corner	35 51 36.0	87 28 25.0
Goodrich depot, northeast corner	35 50 38.5	87 28 48.4
Grinders, switch block	35 47 36.7	87 29 08.6
Centerville depot, southeast corner	35 46 43.1	87 28 27.8
Twoumey depot	35 45 51 7	87 27 56.4
Owan Junction, switch block	35 41 57.9	87 29 23.4
Ætna depot	35 39 21.8	87 30 18.1
Kimmins depot	35 37 18.8	87 32 18.8
Hohenwald depot	35 32 53.2	87 33 04.4
Hohenwald, north copper bolt	35 32 56.0	87 33 06.3
Hohenwald, south copper bolt	35 32 50.5	87 33 08.9
Mannie, copper bolt	35 26 13.5	87 35 59.4

ILLINOIS.

PRIMARY RAILROAD TRAVERSE.

The following geographic positions were determined from primary railroad traverse by Mr. George T. Hawkins, starting at Seehorn triangulation station of the Mississippi River Commission, and running along the Wabash Railroad to Springfield, connecting with United States Coast and Geodetic Survey astronomic pier in capitol grounds; then from junction of Wabash with Chicago, Peoria and St. Louis Railroad at Jacksonville, along the latter road to Springfield via Havana, and from Havana to a point about 10 miles northwest of Havana along narrow-gauge railway.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Seehorn triangulation station	39 45 38.9	91 15 55.1
Junction of railroads at Hull	39 42 20.8	91 12 26.2
Kinderhook depot	39 42 05.5	91 09 16.3
Barry depot	39 42 01.4	91 02 27.4
Corner secs. 19, 30, 25, 24, T. 4 S., Rs. 5, 6 W	39 41 54.5	91 01 46.9
Arden depot	39 43 17.5	90 56 36.9
Corner secs. 7, 18, 13, 12, T. 4 S., Rs. 4, 5 W	39 43 39.9	90 54 56.2
Baylis depot	39 43 41.8	90 54 30.4
New Salem depot	39 42 02.8	90 50 42.7
¼ corner secs. 19, 24, T. 4 S., Rs. 3, 4 W	39 42 01.6	90 47 59.1
Pittsfield Junction	39 42 01.7	90 47 45.0
Griggsville depot	39 42 03.1	90 43 55.4
¼ corner secs. 23, 24, T. 4 S., R. 3 W	39 42 02.6	90 42 13.0
Valley City depot	39 42 22.0	90 39 07.9
Middle drawbridge at Valley City	39 42 23.6	90 38 44.1
Naples depot	39 45 09.6	90 36 26.2
Corner secs. 7, 18, 13, 12, T. 15 N., Rs. 13, 14 W	39 45 15.0	90 35 45.8
Bluffs depot	39 44 59.8	90 32 10.6
Neeleys depot	39 45 20.5	90 28 34.8
Morgonton depot	39 45 53.8	90 25 52.2
Chapin railroad junction	39 45 54.4	90 24 03.4
Center sec. 16, T. 15 N., R. 11 W	39 44 44.0	90 19 39.2
Markham depot	39 44 44.0	90 19 38.8
¼ corner secs. 13, 18, T. 15 N., Rs. 10, 11 W	39 44 42.4	90 15 41.5
Jacksonville, junction Wabash and Chicago, Peoria and St. Louis railroads	39 44 11.9	90 13 11.0
Section corner 2 miles east of Jacksonville and 600 feet north of railroad	39 44 06.5	90 11 46.1
Arnold depot	39 43 19.0	90 08 40.3
Orleans depot	39 43 25.9	90 04 45.7
Alexandria depot	39 43 26.4	90 02 21.0

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Browns Crossing depot	39 43 27.0	89 59 04.4
Island Grove depot	39 43 27.2	89 57 39.3
Corner secs. 19, 30, 25, 24, T. 15 N., Rs. 7, 8 W	39 43 33.2	89 55 38.9
Berlin depot	39 43 27.6	89 54 42.6
Bates depot	39 43 28.1	89 50 54.9
Corran depot	39 44 30.2	89 46 17.5
¼ corner secs. 16, 21, T. 15 N., R. 6 W	39 44 31.8	89 46 17.1
Junction of Wabash and Chicago, Peoria and St. Louis railroads	39 44 38.1	89 45 43.9
Sanger depot	39 45 13.8	89 43 11.4
¼ corner secs. 7, 8, T. 15 N., R. 5 W	39 45 53.1	89 41 10.8
Junction of Wabash and Chicago and Alton railroads	39 46 19.0	89 39 09.0
Springfield pier (United States Coast and Geodetic Survey)	39 47 56.8	89 39 19.4
Corner secs. 3, 4, Ts. 15, 16 N., R. 10 W	39 47 09.2	90 12 38.2
Leiterberry depot	39 51 08.1	90 11 58.8
Corner secs. 2, 3, Ts. 16, 17 N., R. 10 W	39 52 23.6	90 12 06.8
Little Indian depot	39 53 14.3	90 12 06.6
Corner secs. 14, 15, 22, 23, T. 17 N., R. 10 W	39 55 00.3	90 12 05.9
Railway junction, Virginia	39 56 58.5	90 12 05.1
¼ corner secs. 2, 35, Ts. 17, 18 N., R. 10 W	39 57 37.8	90 11 31.2
Anderson depot	39 58 54.7	90 09 35.7
Chandlerville depot	40 02 59.7	90 09 08.6
Corner secs. 29, 30, 31, 32, Ts. 18, 19 N., R. 9 W.	40 03 51.1	90 08 43.7
Corner secs. 7, 8, 17, 18, at Saidora	40 06 16.5	90 08 44.3
Saidora depot	40 06 17.8	90 08 44.3
Corner secs. 5, 6, 31, 32, Ts. 19, 20 N., R. 9 W	40 08 00.6	90 08 44.7
Bath depot	40 11 28.4	90 08 19.0
¼ corner secs. 27, 34, T. 21 N., R. 9 W	40 13 50.7	90 06 20.8
Corner secs. 7, 18, 13, 12, T. 21 N., Rs. 8, 9 W	40 16 28.9	90 03 24.0
¼ corner secs. 17, 20, T. 20 N., R. 8 W	40 10 37.6	90 01 27.4
Kilbourne depot	40 09 08.3	90 00 43.7
Oakford depot	40 06 09.2	89 57 55.1
Atterberry depot	40 03 36.4	89 55 29.9
Corner secs. 29, 30, 31, 32, T. 19 N., R. 7 W	40 03 41.3	89 55 21.7
Corner at Hilltop, 340 feet north of railroad	40 01 32.1	89 52 29.7
Petersburg depot	40 00 41.2	89 50 46.4
Corner secs. 19, 30, 25, 24, T. 18 N., Rs. 6, 7 W	39 59 21.8	89 49 38.8
Tice depot	39 59 07.7	89 47 42.8
¼ corner secs. 26, 27, T. 18 N., R. 6 W	39 58 57.9	89 45 07.7
Athens depot	39 57 53.1	89 43 27.9
Cantrell depot	39 56 14.8	89 40 32.4

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Corner (?) secs. 15, 16, 21, 22, T. 17 N., R. 5 W	39 55 56.6	89 39 54.6
¼ corner secs. 27, 28, 1 mile north of Cora	39 54 38.6	89 38 42.6
Cora depot	39 53 45.7	89 38 07.0
Junction of Chicago and Alton with Chicago, Peoria and St. Louis railroads	39 49 51.5	89 38 03.8
Junction of Chicago and Alton with Baltimore and Ohio railroads	39 48 16.8	89 39 05.6
Havana depot	40 17 37.2	90 03 56.0
West Havana depot	40 17 55.3	90 04 15.7
Center sec. 11, T. 4 N., R. 3 E	40 19 39.3	90 06 54.6
Corner secs. 1, 2, 11, 12, T. 4 N., R. 3 E	40 20 58.8	90 07 28.5
SW. corner NE. ¼ of NE. ¼ sec. 3, T. 4 N., R. 3 E.	40 21 37.5	90 08 53.5

IOWA AND ILLINOIS.

PRIMARY RAILROAD TRAVERSE.

The following geographic positions were determined by Mr. George T. Hawkins from primary railroad traverse from Convent triangulation station of the Mississippi River Commission near Dubuque, Iowa, westward to Independence, thence southward to Iowa City, thence eastward to the astronomic pier of the United States Engineers near Rock Island, Illinois:

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Convent triangulation station	42 28 38.8	90 39 25.5
Corner secs. 30, 31, 36, 25, T. 89 N., R. 1 E	42 29 15.1	90 46 48.0
Peosta depot	42 26 58.3	90 51 01.9
Epworth depot	42 26 53.0	90 55 57.4
¼ corner secs. 9, 10, T. 88 N., R. 1 W	42 26 53.0	90 57 06.9
Farley depot	42 26 41.6	91 00 26.8
¼ corner secs. 7, 12, T. 88 N., Rs. 1, 2 W	42 26 56.3	91 00 52.7
Dyersville depot	42 29 10.4	91 07 15.0
Corner secs. 30, 31, 36, 25, T. 89 N., Rs. 2, 3 W.	42 29 09.9	91 08 05.1
Corner secs. 30, 31, 36, 25, T. 89 N., Rs. 3, 4 W.	42 29 09.9	91 15 12.0
Earlville depot	42 28 54.7	91 16 16.0
Delaware depot	42 28 39.8	91 20 38.4
Crossing of railroads at Delaware	42 28 38.7	91 20 56.2
¼ corner secs. 31, 36, T. 89 N., Rs. 4, 5 W	42 28 40.8	91 22 20.0
Manchester depot	42 28 55.3	91 27 39.4
¼ corner secs. 31, 36, T. 89 N., Rs. 5, 6 W	42 28 38.3	91 29 26.7
Masonville depot	42 28 54.8	91 35 37.0

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Corner secs. 30, 31, 36, 25, T. 89 N., Rs. 6, 7 W.	42 29 05.0	91 36 33.7
Corner secs. 31, 36, T. 89 N., Rs. 7, 8 W	42 28 09.7	91 43 40.1
Winthrop depot	42 28 23.4	91 44 05.1
Independence depot (Illinois Central)	42 28 43.7	91 53 36.7
Junction of railroads at Independence	42 28 42.8	91 54 28.9
Independence depot (Burlington, Cedar Rapids and Northern)	42 28 10.4	91 54 21.4
¼ corner secs. 2, 35, Ts. 87, 88 N., R. 9 W	42 23 12.0	91 51 40.8
Rowley depot	42 22 12.9	91 50 43.4
Corner secs. 7, 18, 13, 12, T. 87 N., Rs. 8, 9 W	42 21 28.3	91 49 55.3
Corner secs. 32, 33, T. 87 N., R. 8 W.	42 17 31.4	91 47 40.7
Walker depot	42 17 13.7	91 47 01.1
Corner secs. 32, 33, T. 86 N., R. 8 W	42 12 33.9	91 47 07.8
Center Point depot	42 11 37.3	91 46 55.6
Toddville depot	42 05 50.8	91 43 04.2
Corner 1 mile north of junction Burlington, Cedar Rapids and Northern with Milwaukee and Superior railways	42 02 53.5	91 42 19.3
Junction of Burlington, Cedar Rapids and Northern with Milwaukee and Superior railways	42 01 49.9	91 42 52.1
South end of old depot at Cedar Rapids	41 58 49.2	91 40 04.6
Crossing of Burlington, Cedar Rapids and Northern and Chicago and Northwestern railways	41 56 44.4	91 38 19.2
Summit depot	41 54 56.5	91 37 48.5
Corner secs. 19, 30, 25, 24, T. 82 N., Rs. 6, 7 W	41 53 23.7	91 35 58.5
¼ corner south of sec. 32, T. 82 N., R. 6 W	41 51 38.1	91 34 13.2
Ely depot	41 52 27.8	91 35 10.1
Solon depot	41 47 55.6	91 29 41.3
¼ corner secs. 31, 32, T. 81 N., R. 5 W	41 46 48.3	91 27 52.2
Morse depot	41 44 56.6	91 26 12.9
Elmyra depot	41 43 13.9	91 25 23.2
Graham depot	41 40 37.7	91 26 34.2
Corner secs. 5, 6, 7, 8, T. 79 N., R. 6 W	41 40 13.4	91 27 50.3
Iowa City depot (Burlington, Cedar Rapids and Northern)	41 39 27.0	91 31 49.2
Iowa City depot (Rock Island)	41 39 06.9	91 31 42.1
Corner secs. 5, 6, 7, 8, T. 79 N., R. 6 W	41 40 12.7	91 34 41.7
Crossing of range line between Rs. 6, 7 W	41 40 51.2	91 35 49.7
Corner secs. 18, 19, 24, 13, T. 79 N., Rs. 5, 6 W	41 38 31.1	91 29 02.0
Corner secs. 30, 31, 36, 25, T. 79 N., Rs. 4, 5 W	41 36 44.9	91 22 03.4
Downey depot	41 36 58.5	91 21 03.5

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Railway junction at West Liberty	41 34 15.3	91 16 09.0
¼ corner secs. 8, 17, T. 79 N., R. 3 W	41 34 02.9	91 13 18.7
Atalissa depot	41 34 10.8	91 09 59.8
Corner secs. 6, 7, 12, 1, T. 78 N., Rs. 2, 3 W	41 35 06.8	91 08 05.5
Moscow depot	41 34 28.5	91 04 38.0
Wilton depot	41 35 14.5	91 01 02.8
Corner secs. 5 6, 31, 32, Ts. 78, 79 N., R. 1 W	41 35 49.6	90 59 48.2
Durant depot	41 35 59.0	90 54 34.1
Corner Muscatine, Scott, and Cedar counties	41 35 48.4	90 54 00.0
County and township line	41 35 48.4	90 53 29.2
Crossing of Burlington, Cedar Rapids and Northern and Rock Island railways	41 35 32.4	90 51 51.6
Stockton depot	41 35 30.1	90 51 30.0
Corner secs. 6, 7, 12, 1, T. 78 N., Rs. 1, 2 E	41 34 55.2	90 47 02.6
Walcott depot	41 35 07.2	90 46 32.0
Corner secs. 7, 18, 13, 12, T. 78 N., Rs. 2, 3 E	41 34 02.4	90 40 06.1
Rock Island astronomical pier	41 31 04.4	90 33 39.4
Corner secs. 19, 20, 29, 30, T. 29 N., R. 2 W. (Illinois)	42 29 29.4	90 38 42.1

MINNESOTA AND WISCONSIN.

PRIMARY RAILROAD TRAVERSE.

The following geographic positions were determined by Mr. George T. Hawkins from primary traverse from Ramsey, Minnesota, triangulation station of the United States Coast and Geodetic Survey, northward over the St. Paul and Duluth Railroad to Bald Eagle Junction, Minnesota, thence over the "Soo" Railroad to St. Croix, Wisconsin; thence across country to Taylor Falls, Minnesota; thence over the St. Paul and Duluth Railroad to Bald Eagle Junction.

MINNESOTA.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Ramsey (United States Coast and Geodetic Survey)	44 59 19.2	93 00 19.0
White Bear depot	45 05 05.2	93 00 27.5
Bald Eagle Junction	45 05 56.5	93 00 03.8
White Bear Beach depot	45 06 06.7	92 59 21.5
Withrow depot	45 07 25.8	92 53 43.9
SE. corner sec. 36, T. 31 N., R. 21 W	45 07 23.6	92 53 42.3
Maple Island depot	45 10 24.3	92 51 08.5
Marine depot	45 11 57.4	92 46 53.9
Middle of drawbridge north of Marine	45 16 34.6	92 45 31.7

WISCONSIN.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Osceola depot	45 19 00.1	92 42 26.8
Center sec. 27, T. 33 N., R. 19 W. (SE. corner of cemetery ½ mile east of Osceola)	45 19 15.2	92 41 46.3
Dresser Junction depot	45 21 11.3	92 37 55.2
Corner secs. 7, 8, 17, 18, T. 33 N., R. 18 W. (1,000 feet east of Dresser depot)	45 21 12.3	92 37 47.4
St. Croix depot	45 24 31.0	92 38 18.4
East end bridge Taylor Falls	45 24 02.9	92 38 54.5

MINNESOTA.

Taylor Falls depot	45 24 01.3	92 39 06.2
Franconia depot	45 22 50.0	92 41 06.6
NW. corner sec. 2, T. 34 N., R. 19 W. (½ mile northwest of Franconia)	45 22 56.4	92 41 27.5
Shafer depot	45 23 12.5	92 44 45.4
¼ corner secs. 34, 35, T. 34 N., R. 20 W. (at Center City)	45 23 25.3	92 48 52.2
Center City depot	45 23 24.6	92 48 52.7
Lindstrom depot	45 23 23.3	92 50 50.1
Chisago depot	45 22 22.9	92 53 14.4
¼ corner secs. 11, 12, T. 33 N., R. 21 W. (1¼ miles west of Chisago)	45 21 38.0	92 54 49.6
Corner secs. 17, 18, 19, 20, T. 33 N., R. 21 W.	45 20 09.8	92 59 45.7
Forest Lake depot	45 16 42.4	92 58 59.8
Corner secs. (numbers unknown) 2¼ miles southeast of Forest Lake, 1,100 feet east of railroad	45 14 32.8	92 58 38.3
Corner secs. 4, 5, 8, 9, T. 31 N., R. 21 W.	45 11 44.4	92 58 33.6
Hugo depot	45 09 30.8	92 59 28.6

NORTH DAKOTA.

PRIMARY RAILROAD TRAVERSE.

The following geographic positions were determined by Mr. George T. Hawkins from primary railroad traverse from the astronomic pier of the United States Geological Survey at Jamestown, North Dakota, northward to Covington, thence southeastward over the "Soo" Railroad to its junction with the Northern Pacific Railroad at Odell, thence returning to Jamestown.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Jamestown astronomical pier	46 54 13.5	98 42 10.2
N. corner, secs. 3, 4, T. 140 N., R. 64 W	46 58 45.2	98 45 09.9
Buchanan depot	47 03 48.1	98 49 29.1
Corner secs. 5, 6, 31, 32, Ts. 141, 142 N., R. 64 W.	47 03 58.1	98 49 28.5
Corner secs. 2, 3, 34, 35, Ts. 142, 143 N., R. 65 W	47 09 11.4	98 53 15.8
Pingree depot	47 09 52.0	98 54 10.4
¼ corner secs. 6, 31, Ts. 143, 144 N., R. 65 W	47 14 24.2	98 57 43.1
Edmunds depot	47 14 50.3	98 58 01.6
S. corner secs. 35, 36, T. 145 N., R. 66 W	47 19 35.5	99 01 45.4
Melville depot	47 20 04.2	99 02 05.9
Forquar depot	47 23 36.0	99 04 51.3
Corner secs. 1, 6, 31, 36, Ts. 146, 147 N., Rs. 65, 66 W	47 24 47.8	99 00 29.0
Bordulac depot	47 23 18.6	98 57 34.7
Corner secs. 13, 18, 19, 24, T. 145 N., Rs. 64, 65 W.	47 22 10.7	98 52 50.0
Kensal depot	47 17 56.1	98 43 50.8
Corner secs. 12, 13, 18, 7, T. 144 N., Rs. 53, 54 W	47 17 52.2	98 43 05.8
Courtney depot	47 13 20.7	98 33 45.4
¼ corner secs. 25, 30, T. 143 N., Rs. 61, 62 W	47 10 28.1	98 27 53.1
Wimbledon depot	47 10 03.9	98 27 27.4
Corner secs. 13, 18, 19, 24, T. 142 N., Rs. 60, 61 W.	47 06 34.1	98 20 16.6
Leal depot	47 06 12.4	98 18 46.6
Clive depot	47 04 29.8	98 12 31.1
Junction of "Soo" and Northern Pacific railways	47 04 18.3	98 11 49.1
Odell depot	47 03 49.4	98 11 44.2
Lowry depot	47 01 03.0	9 11 23.6
N. corner secs. 1, 2, T. 140 N., R. 60 W	46 58 42.8	98 12 13.3
Sanborn depot	46 56 22.9	98 13 12.0
SW. corner sec. 14, T. 140 N., R. 60 W	46 56 01.5	98 13 27.1
¼ corner on S. side sec. 14, T. 140 N., R. 61 W	46 56 03.2	98 20 27.6
SW. corner sec. 14, T. 140 N., R. 62 W	46 56 00.0	98 28 43.2

SOUTH DAKOTA.

SIOUX FALLS ASTRONOMIC STATION.

The pier for this station is in the grounds of the United States Government building, east of and opposite to the center of the building. The computed latitude is 43° 32′ 34″.53; probable error, ±0″.11; longitude, 96° 43′ 28″.66; probable error, ±0″.68.

SOUTH DAKOTA AND IOWA.

PRIMARY RAILROAD TRAVERSE.

The following geographic positions were determined by Mr. George T. Hawkins from primary railroad traverse between a bench mark located by triangulation of the Missouri River Commission at Elk Point, South Dakota, and the astronomic pier of the United States Geological Survey at Sioux Falls, South Dakota, and between the latter point and a bench mark located by triangulation of the Missouri River Commission at Yankton, South Dakota, via Mitchell.

SOUTH DAKOTA.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Elk Point	42 41 05.3	96 40 57.6
Bench mark Missouri River Commission		
Corner secs. 17, 18, 19, 20, T. 91 N., R. 49 W	42 41 32.8	96 39 55.3

IOWA.

Westfield depot	42 45 20.2	96 36 21.5
Corner Ts. 92, 93 N., Rs. 48, 49 W	42 49 19.0	96 33 59.6
Akron depot	42 49 36.9	96 33 41.3
¼ corner secs. 4, 33, Ts. 93, 94 N., R. 48 W	42 54 30.4	96 31 08.8
Chatsworth depot	42 54 49.1	96 31 00.4
Railway junction at Hawarden	42 59 38.9	96 29 18.3
Corner secs. 2, 3, 34, 35 N., Ts. 94, 95 N., R. 48 W.	42 59 46.8	96 29 22.1
Calliope depot	43 00 27.3	96 29 16.9

SOUTH DAKOTA.

Corner secs. 2, 3, 34, 35, Ts. 95, 96 N., R. 48 W.	43 04 58.8	96 28 45.4
Hudson depot	43 07 44.6	96 27 07.5
Fairview depot	43 13 17.0	96 29 03.2

IOWA.

Elm Springs depot	43 13 28.7	96 29 31.2
Section corner ¼ mile southeast of Beloit	43 16 29.2	96 34 01.4
Beloit depot	43 16 49.0	96 34 18.7

SOUTH DAKOTA.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Canton depot	43 17 54.9	96 35 16.6
¼ corner secs. 3, 34, Ts. 98, 99 N., R. 49 W	43 20 39.2	96 37 04.5
¼ corner secs. 7, 12, T. 99 N., Rs. 49, 50 W	43 24 33.6	96 41 12.4
Harrisburg depot	43 25 51.6	96 41 46.5
¼ corner secs. 1, 36, Ts. 99, 100 N., R. 50 W	43 25 52.1	96 41 47.2
Sioux Falls astronomical pier, observed final value	43 32 34.5	96 43 28.7
Corner secs. 30, 31, 36, 25, T. 102 N., Rs. 50, 51 W.	43 36 06.1	96 53 21.3
Hartford depot	43 37 15.4	96 56 41.5
T. 102 N., Rs. 51, 52 W. (section not located)	43 38 05.3	97 00 30.8
Corner Ts. 102, 103 N., Rs. 52, 53 W	43 40 33.7	97 08 00.5
Montrose depot	43 42 04.4	97 10 54.3
Corner secs. 18, 19, 24, 13, T. 103 N., Rs. 53, 54 W.	43 43 03.4	97 14 60.0
Corner secs. 18, 19, 24, 13, T. 103 N., Rs. 54, 55 W.	43 43 01.4	97 22 04.7
Railway junction at Salem	43 43 27.8	97 23 29.8
Corner secs. 18, 19, 24, 13, T. 103 N., Rs. 55, 56 W.	43 43 04.1	97 29 18 4
Spencer depot	43 43 26.5	97 35 33.4
Corner secs. 18, 19, 24, 13, T. 103 N., Rs. 56, 57 W.	43 43 00.9	97 36 22.7
Farmer depot	43 43 26.2	97 41 16.6
Corner secs. 18, 19, 24, 13, T. 103 N., Rs. 57, 58 W.	43 43 01.7	97 43 40.1
Fulton depot	43 43 27.8	97 49 22.1
¼ corner secs. 13, 18, T. 103 N., Rs. 58, 59 W	43 43 28.3	97 50 52.6
Corner secs. 2, 3, 34, 35, Ts. 102, 103 N., R. 60 W.	43 40 23.0	98 00 21.5
¼ corner secs. 2, 35, Ts. 101, 102. N., R. 60 W	43 35 10.6	97 59 44.2
Ethan depot	43 32 52.3	97 59 16.8
Corner secs. 35, 36, Ts. 100, 101 N., R. 60 W	43 29 56.2	97 59 01.3
Corner secs. 5, 6, 31, 32, Ts. 99, 100 N., R. 60 W	43 25 39.5	97 58 35.9
Parkstone depot	43 23 42.5	97 58 48.5
Corner secs. 5, 6, 31, 32, Ts. 98, 99 N., R. 60 W	43 20 27.7	97 58 27.4
¼ corner secs. 31, 6, Ts. 97, 98 N., R. 60 W	43 15 15.8	97 58 54.0
Tripp depot	43 13 22.1	97 57 54.2
Corner secs. 19, 30, 24, 25, T, 97 N., Rs. 59, 60 W.	43 11 51.5	97 52 21.6
Corner secs. 1, 2, 35, 36, Ts. 96, 97 N., R. 59 W	43 10 08.7	97 46 28.4
¼ corner secs. 1, 6, T. 96 N., Rs. 58, 59 W	43 09 43.5	97 45 17.0
Scotland depot	43 08 58.4	97 43 18.2
Corner secs. 7, 18, 13, 12, T. 95 N., Rs. 57, 58 W	43 03 11.3	97 38 09.1
Lesterville depot	43 02 11.4	97 35 34.2
Corner secs. 5, 6, 7, 8, Ts. 93, 94 N., R. 56 W	42 58 50.6	97 29 45.8
Corner secs. 1, 2, 35, 36, Ts. 93, 94 N., R. 56 W	42 54 29.9	97 25 01.0
Yankton bench mark, Missouri River Commission	42 52 18.9	97 23 30.7

NEBRASKA.

Triangulation in Nebraska was extended westward from North Platte by Mr. George T. Hawkins in July and August, 1896. This work is based upon the astronomic position of North Platte, determined by the Wheeler survey in 1874, and upon a base line 5 miles in length, measured near North Platte by Mr. E. M. Douglas in 1892. The average error of closure of all triangles in this scheme is 7″.8.

NORTH PLATTE BASE LINE.

This line was measured in September, 1892, along the tangent of the Union Pacific Railroad, passing through North Platte. The adopted length in feet, after correcting for slope, temperature, and elevation above sea level, is 27,044.564. The azimuth of this line was obtained by observations on Polaris near elongation.

EAST BASE, IN LINCOLN COUNTY.

Eastward 8,658 feet from the Wheeler astronomic pier, on prolongation of the railroad tangent.

Station mark: A stone marked "U. S. G. S. E. B.," with a copper rivet set in its upper surface.

[Latitude, 41° 08′ 07″.77. Longitude, 100° 44′ 00″.85.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	Meters.
Osgood	18 32 09.03	198 31 08.36	3.8309916
Beers	60 10 25.79	240 03 20.18	4.2412534
West base	100 10 11.56	280 06 22.64	3.9160958

WEST BASE, IN LINCOLN COUNTY.

Westward 3½ miles from the North Platte Railroad depot, and 90 feet northward from the railroad track.

Station mark: A stone marked "U. S. G. S. W. B.," with a copper rivet to mark the exact point.

[Latitude, 41° 08′ 54″.81. Longitude, 100° 49′ 48″.79.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	Meters.
Osgood	322 50 15.50	142 53 03.61	3.9947563
Beers	34 37 15.51	214 33 58.59	4.0903129

OSGOOD, IN LINCOLN COUNTY.

About 4 miles southeast from town of North Platte, on edge of bluff in south-central part of sec. 21, T. 13 N., R. 30 W., on land owned by Mr. Osgood.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 04′ 39″.49. Longitude, 100° 45′ 33″.13.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Beers	80 09 57.52	260 03 52.78	4.1191956
McNeil	134 53 21.61	314 44 39.42	4.4162682
North	189 06 42.46	9 07 39.20	4.1035192

BEERS, IN LINCOLN COUNTY.

About 12 miles southwest of the town of North Platte and 8 miles southeast of Hershey, on highest sand hill in northeast part of sec. 31, T. 13 N., R. 31 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 03′ 26″.27. Longitude, 100° 54′ 48″.34.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dexter	109 50 05.37	289 36 38.09	4.4834391
Birdwood	138 27 00.45	318 18 14.18	4.4483106
McNeil	164 57 30.17	344 54 53.42	4.3298834
North	225 16 32.66	45 23 34.54	4.3230335

NORTH, IN LINCOLN COUNTY.

About 4 miles northeast of the town of North Platte, on a sand hill in the northeast ¼ sec. 15, T. 14 W., R. 30 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 11′ 25″.72. Longitude, 100° 44′ 06″.89.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Osgood	9 07 39.20	189 06 42.46	4.1035192
McNeil	106 00 43.12	285 51 03.50	4.3285882

M'NEIL, IN LINCOLN COUNTY.

About 15 miles northwest of town of North Platte and 5 miles due north of Hershey, on a sand hill near the center of sec. 28, T. 15 N., R. 32 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 14′ 35″.34. Longitude, 100° 58′ 46″.56.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dexter	65 53 09.26	245 42 17.38	4.4028722
Birdwood	91 34 19.54	271 28 09.35	4.1165802

BIRDWOOD, IN LINCOLN COUNTY.

Six miles north of Sutherland and 2½ miles northwest of bridge over North Platte River, on sand hill in southwest corner of sec. 29, T. 15 N., R. 33 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 14′ 46″.59. Longitude, 101° 08′ 08″.07.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dexter	43 00 08.60	222 55 26.55	4.1655684
Paxton	62 00 48.73	241 50 18.88	4.4024080
Bald	103 39 37.02	283 29 10.81	4.3566354

DEXTER, IN LINCOLN COUNTY.

About 6½ miles west of Sutherland and 2 miles west of Dexter siding, on high sand hill in south-central part of sec. 30, T. 14 N., R. 34 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 08′ 59″.28. Longitude, 101° 15′ 16″.29.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Paxton	84 36 30.92	264 30 43.42	4.0924546
Bald	142 56 44.26	322 51 00.84	4.3036[illegible]43

PAXTON, IN KEITH COUNTY.

Northwest of the town of Paxton 2½ miles, on a high sand hill in T. 14 N., R. 36 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 08′ 21″.26. Longitude, 101° 24′ 04″.44.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ogallala	101 21 44.07	281 10 31.53	4.3854639
White	142 09 07.51	322 01 13.88	4 4350720
Bald	180 32 35.92	0 32 40.54	4.2361010

BALD, IN KEITH COUNTY.

North of the town of Paxton 12 miles, on a prominent sand hill in sec. 12, T. 15 N., R. 36 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 17′ 39″.53. Longitude, 101° 23′ 57″.42.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ogallala	62 35 21.47	242 24 03.56	4.4315603
White	104 14 23.64	284 06 24.65	4.2407088

OGALLALA, IN KEITH COUNTY.

About 4 miles northeast of the town of Ogallala, on the north edge of the table-land between the Platte rivers, in T. 14 N., R. 38 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 10′ 55″.15. Longitude, 101° 41′ 06″.27.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Brule	100 14 25.64	280 05 53.60	4.2650062
Davis	145 19 32.10	325 12 53.21	4.3927686
White	202 50 46.48	22 54 06.49	4.2592478

WHITE, IN KEITH COUNTY.

About 18 miles northeast of Ogallala, on high sand hill east of the waters of White Clay Creek, in T. 16 N., R. 37 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 19′ 57″.69. Longitude, 101° 36′ 02″.97.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Brule	61 54 11.89	241 42 18.92	4.4555242
Davis	99 40 18.66	279 30 18.80	4.3305797

BRULE, IN KEITH COUNTY.

About 13 miles northwest of Ogallala and 18 miles north of the town of Brule, on north edge of the table-land between North and South Platte rivers, in T. 14 N., R. 40 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 12′ 40″.51. Longitude, 101° 54′ 03″.84.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lewellen	111 11 13.44	291 01 31.20	4.3432331
Blue	131 35 40.36	311 23 01.22	4.5526856
Davis	193 15 25.34	13 17 19.41	4.2435580

DAVIS, IN KEITH COUNTY.

About 23 miles northwest of Ogallala, on high sand hill one-half mile north of the Davis ranch, in sec. 12, T. 16 N., R. 40 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 21′ 53″.29. Longitude, 101° 51′ 10″.97.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
White	279 30 18.80	99 40 18.66	4.3305797
Lewellen	69 43 56.88	249 32 19.60	4.4182364
Blue	102 14 27.84	281 59 53.23	4.4973225

LEWELLEN, IN DEUEL COUNTY.

About 18 miles northwest of Big Spring and 1½ miles west of a sheep ranch on Ash Creek, on the north edge of the table between North and South Platte rivers, in T. 15 N., R. 42 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 16′ 57″.79. Longitude, 102° 08′ 46″.95.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Combs	117 32 27.19	297 19 19.68	4.4944967
Grouse	137 46 09.64	317 34 50.77	4.5491784
Blue	158 29 39.73	338 26 43.52	4.2277131

BLUE, IN DEUEL COUNTY.

About 7 miles northeast of Oshkosh post-office, on a high sand hill on the west side of Blue River, in T. 17 N., R. 43 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 25′ 27″.18. Longitude, 102° 13′ 13″.64.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Combs	86 32 39.98	266 22 27.80	4.3330710
Grouse	120 46 11.12	300 37 47.93	4.3118602

COMBS, IN DEUEL COUNTY.

About 10 miles west of Oshkosh post-office, on an isolated knob on the land owned by Mr. Combs, 1½ miles south of ranch, in T. 17 N., R. 45 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 24′ 44″.08. Longitude, 102° 28′ 39″.02.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Nelson	145 27 14.74	325 21 06.62	4.3559601
Sidney	104 57 26.18	284 45 53.61	4.4002332
Grouse	198 01 15.68	18 03 5.30	4.0937042

GROUSE, IN DEUEL COUNTY.

About 10 miles northwest of Oshkosh post-office and 3 miles west of Hartman post-office, on a prominent sand hill in T. 18 N., R. 45 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 31′ 6″.52. Longitude, 102° 25′ 53″.47.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sidney	79 19 53.57	259 06 30.62	4.4566232
Nelson	112 27 16.26	292 19 17.95	4.2570990

SIDNEY, IN CHEYENNE COUNTY.

About 26 miles northeast of Sidney and 8 miles northwest of Weyerts post-office, in T. 17 N., R. 47 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 28′ 13″.03. Longitude, 102° 46′ 05″.40.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Wagoner	177 5 32.2	....	4.41242
Nelson	222 52 24.75	42 57 50.12	4.22298

NELSON, IN CHEYENNE COUNTY.

About 4 miles west of Nelson's horse ranch, in sec. 6, T. 18 N., R. 46 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 34′ 49″.68. Longitude, 102° 37′ 54″.61.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Grouse	292 19 17.95	112 27 16.26	4.2570990

WAGONER, IN CHEYENNE COUNTY.

About 4 miles south of Hibler's ranch, in southwest ¼ sec. 18, T. 20 N., R. 47 W.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 41° 42′ 09″.97. Longitude, 102° 47′ 01″.68.]

To station—	Azimuth.	Back azimuth.	Log. distance.
		° ′ ″	*Meters.*
Nelson	....	137 01 49.3	4.26888
Sidney	....	177 02 32.2	4.41242

COURTHOUSE ROCK, IN CHEYENNE COUNTY (secondary).

About 6 miles southeast of Camp Clark, an isolated knob in T. 19 N., R. 50 W.

ARKANSAS.

Three stations in Garland County for the control of the Hot Springs special map were located by Mr. George T. Hawkins in December, 1896. Their geodetic positions depend upon the positions of stations Smith and Powell, which were located from the Little Rock and Fort Smith bases during the season of 1888.

WEST, IN GARLAND COUNTY.

On the highest point of the West Mountain and about 2½ miles from the Arlington Hotel in Hot Springs. The summit is partially cleared of timber and lines are chopped through.

Station mark: A post-oak tree on northeast point of summit.

[Latitude, 34° 30′ 21″.17. Longitude, 93° 06′ 04″.60.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Valley	227 46 05.09	47 49 20.78	4.0748232
Ouachita	155 08 37.19	335 04 21.30	4.4355799

VALLEY, IN GARLAND COUNTY.

On end of spur running northeast from Sugarloaf Mountain, about 5 miles from Hot Springs and one-fourth mile west of Hot Springs and Mountain Valley Road. Summit cleared of timber.

Station mark: A red-oak tree.

[Latitude, 34° 34′ 40″.17. Longitude, 93° 00′ 19″.48.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
West	47 49 20.78	227 46 05.09	4.0748232
Ouachita	129 38 46.98	309 31 14.62	4.4197324
Smith	173 53 51.33	353 53 00.39	4.3308182

OUACHITA, IN GARLAND COUNTY.

On the highest point of the Ouachita range of mountains, 32 miles from Hot Springs. The summit is cleared of timber.

Station mark: A post-oak tree, trimmed.

[Latitude, 34° 43′ 43″.74. Longitude, 93° 13′ 35″.04.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Valley	309 31 14.62	129 38 46.98	4.4197324
West	335 04 21.30	155 08 37.19	4.4355799
Powell	111 16 49.20	291 12 43.82	4.0700007
Smith	255 43 51.34	75 50 33.76	4.2677568

KANSAS.

The triangulation in western Kansas, executed during the field season of 1896 by Prof. A. H. Thompson, is based upon the line Basin-Hartland, determined from the Spearville base and astronomic station, by Mr. H. L. Baldwin, jr., in 1889. The azimuth of this line was determined by observations on Polaris at station Hartland, and differs from the azimuth as computed from the Spearville base 2″.2. The instrument used was a Fauth 8-inch theodolite reading by micrometer microscopes to 2″.0. The method of observing usually adopted was that of directions.

The mean closure error of the triangles in this belt is 2″.41.

BASIN, IN KEARNY COUNTY.

On a high, round hill, about 6 miles west of south from Hartland. The hill is of loose sand, and changes in appearance year by year on account of the drifting of the sand. In the SW. ¼ sec. 8, T. 26 S., R. 37 W.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B.M." This is the same as the station occupied in the triangulation of 1889.

[Latitude, 37° 47′ 48″.35. Longitude, 101° 23′ 38″.21]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hartland	186 34 45.62	6 35 25.75	4.1442130
Hummock	235 26 50.99	55 32 47.76	4.2369200
Sand Cone	289 30 17.66	109 35 03.71	4.0837027
Spurgeon	313 05 05.58	133 12 05.09	4.3619379
Appomattox	345 29 23.43	165 31 12.22	4.2405030
Prairie Pole	52 49 04.35	232 46 17.79	3.9219581
Pattin	81 26 31.60	261 21 51.68	4.0533341
Myrtle	106 08 32.66	286 01 39.32	4.2345072
Kendall	156 59 58.73	336 56 56.53	4.2682011
Cupola Hartland schoolhouse	192 43 00.89	12 43 59.02	4.0218880
Cupola Lakin schoolhouse	216 39 47.39	36 44 48.92	4.3029409

HARTLAND, IN KEARNY COUNTY.

Two and a half miles north of the village of Hartland. The station is 35 feet north and 9 feet east of the W. ¼ corner of sec. 34, T. 24 S., R. 37 W., and is the same station as that occupied in the triangulation of 1889.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

Underground mark: A bottle 4 feet below surface of ground. A witness stone is set 14 feet east of station post.

[Latitude, 37° 55′ 17″.46. Longitude, 101° 22′ 32″.82.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hummock	287 51 08.68	107 56 25.79	4.1222780
Sand Cone	331 13 26.68	151 17 33.02	4.3100252
Myrtle	63 21 20.34	243 13 46.27	4.3059998
Kendall	110 02 14.66	289 58 31.97	3.9736772

HUMMOCK, IN KEARNY COUNTY.

In the NE. ¼ sec. 14, T. 25 S., R. 36 W., on the summit of the highest sand hill in the vicinity. It is about 4 miles east of south from the village of Lakin, Kansas. It is the same station as that occupied by Mr. H. L. Baldwin in 1889.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 53′ 05″.37. Longitude, 101° 13′ 56″.65.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sand cone	11 28 06 00	191 27 55.71	4.1495786
Cupola Hartland schoolhouse	92 22 09.86	272 17 10.89	4.0757602
Cupola Lakin schoolhouse	160 47 39.25	340 46 43.75	3.8263668

SAND CONE, IN KEARNY COUNTY.

In sec. 28, T. 26 S., R. 36 W., on the summit of the highest sand hill within several miles. The hill was almost a perfect cone when occupied, but is liable to change its appearance from the drifting of the sand.

Station mark: An iron post with brass cap marked "U. S. Geological survey. B. M."

[Latitude, 37° 45′ 36″.78. Longitude, 101° 15′ 51″.27.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Glazier	306 33 29.78	126 40 41.66	4.3334622
Spurgeon	335 20 38.58	155 22 52.33	4.1088607
Appomattox	29 00 19.71	208 57 22.79	4.1648976
Prairie Pole	86 54 43.06	266 47 11.29	4.2580170
Silver Pole	282 19 45.03	102 25 35.64	4.1578350

APPOMATTOX, IN GRANT COUNTY.

In the northwest corner of the NE. ¼ sec. 3, T. 28 S., R. 37 W., distant 1,281 feet from the northeast corner of the section. It is a few rods west of the road leading from Ulysses to Hartland, and on the highest ground in the vicinity.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 38′ 41″.99. Longitude, 101° 20′ 40″.40.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Spurgeon	264 52 00.98	184 57 11.05	4.4096817
Prairie Pole	136 58 58.88	316 54 23.86	4.2078581
Cupola Ulysses schoolhouse.	348 04 11.08	168 04 53.34	3.9149455
Bland	78 40 40.98	258 37 52.09	3.8377723
Appomattox church	37 28 59.98	217 28 03.94	3.5680468

SPURGEON, IN GRANT COUNTY.

In the SE. ¼ sec. 36, T. 27 S., R. 36 W., on the highest ground in the section.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 39′ 17″.95. Longitude, 101° 12′ 12″.60.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Glazier	275 34 38.91	95 39 36.64	4.0794221
Silver Pole	225 19 00.63	45 22 37.73	4.0874600
Estelle	346 09 09.58	166 09 54.34	3.8769631
NW. corner sec. 36, T. 27 S., R. 36 W	125 23 31.33	305 23 03.11	3 1425948

GLAZIER, IN HASKELL COUNTY.

In the NW. ¼ sec. 6, T. 27 S., R. 34 W.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 38′ 39″.82. Longitude, 101° 04′ 05″.17.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Silver Pole	161 39 36.26	341 38 15.38	4.0126338
Estelle	58 52 30.14	238 48 17.47	4.0742180
NW. corner sec. 6, T. 27 S., R. 34 W	154 03 28.64	334 03 23.16	2.6993843

PRAIRIE POLE, IN KEARNY COUNTY.

In the SW. ¼ sec. 27, T. 26 S., R. 38 W.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 45′ 04″.48. Longitude, 101° 28′ 10″.13.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Patton	126 36 49.49	306 34 56.29	3.7512395
Cupola Ulysses schoolhouse	327 17 05.46	147 22 22.56	4.3722561
Appomattox church	329 11 38.86	149 15 18.69	4.2340431
Bland	341 58 18.12	162 00 04.90	4.1406244
SW. corner sec. 27, T. 26 S., R. 38 W	65 59 49.86	245 59 44.25	2.3903461

PATTON, IN KEARNY COUNTY.

In sec. 18, T. 26 S., R. 38 W. On highest ground in immediate vicinity.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 46′ 53″.53. Longitude, 101° 31′ 15″.12.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Myrtle	140 31 03.77	320 48 46.62	3.9217969
Basin	261 21 51.68	81 26 31.60	4.0533341
Prairie Pole	306 34 56.29	126 36 49.49	3.7512395

KENDALL, IN KEARNY COUNTY.

In the southwest corner of the NW. ¼ sec. 22, T. 24 S., R. 38 W., about 3½ miles north of east from the village of Kendall.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 57′ 01″.90. Longitude, 101° 28′ 34″.99.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Myrtle	36 51 29.29	216 47 38.13	4.1869966
Haines	54 44 23.22	234 37 31.06	4.3030221
Mayline	121 40 24.67	301 35 56.28	4.0969694
SE. corner sec. 22, T. 24 S., R. 38 W	314 48 00.94	134 48 21.15	3.0527993

MYRTLE, IN HAMILTON COUNTY.

In the NE. ¼ sec. 34, T. 25 S., R. 39 W., on the highest ground in the vicinity, 7 miles a little west of south from the village of Kendall.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 50′ 22″.56. Longitude, 101° 34′ 52″.32.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Haines	95 34 04.10	275 31 03.93	3.8581913
Mayline	175 39 10.21	355 38 34.07	4.2770180
Hartland	243 13 46.27	63 21 20.34	4.3059998
Basiu	286 01 39.32	106 08 32.66	4.2345072
NE. corner sec. 34, T. 25 S., R. 39 W	239 39 29.32	59 39 37.12	2.5547876
Schoolhouse, district 49	57 57 04.00	237 55 44.03	3.5754482

MAYLINE, IN HAMILTON COUNTY.

In the SE. ¼ sec. 29, T. 24 S., R. 38 W., about 5 miles east of north from Mayline switch on the Atchison, Topeka and Santa Fe Railroad, on level ground, there being no considerable elevation in the vicinity.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 38° 00′ 34″.59. Longitude, 101° 35′ 51″.12.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Haines	17 32 17.76	197 29 53.40	4.2800450
North Syracuse	127 29 03.69	307 21 47.85	4.3363658
South Syracuse	40 54 38.66	220 48 37.55	4.3409588
E. ¼ corner sec. 29, T. 24 S., R. 38 W	197 50 29.28	7 50 31.62	2.8327053

HAINES, IN HAMILTON COUNTY.

In the SE. ¼ sec. 25, T. 25 S., R. 40 W., on the highest ground for some distance around, and about 9 miles southwest of the village of Kendall.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 50′ 45″.14. Longitude, 101° 39′ 46″.00.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South Syracuse	100 29 00.49	280 25 24.16	3.9427040
North Syracuse	159 52 19.97	339 47 28.94	4.5238193
Cupola Syracuse schoolhouse	153 31 56.49	333 28 43.70	4.2350962
Schoolhouse, district 49	303 59 27.93	124 01 08.09	3.6827552
SW. corner sec. 25, T. 25 S., R. 40 W	31 50 08.49	211 49 58.20	2.8905513

NORTH SYRACUSE, IN HAMILTON COUNTY.

In the NW. ¼ sec. 24, T. 22 S., R. 41 W., about 10 miles north of the village of Syracuse, on the highest ground for some distance around.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 38° 07′ 42″.20. Longitude, 101° 47′ 37″.96.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South Syracuse	354 23 55.65	174 25 09.16	4.4758062
Limestone Point	30 09 47.78	210 03 24.14	4.4813681
Bridge Creek	80 01 33.08	259 55 52.87	4.1346121
NW. corner sec. 24, T. 22 S., R. 41 W	132 36 50.65	312 36 42.62	2.6338458

SOUTH SYRACUSE, IN HAMILTON COUNTY.

In the SE. ¼ sec. 24, T. 25 S., R. 41 W., on the highest ground in the vicinity, and about 8 miles south of the village of Syracuse, a few feet west of the county road leading from Syracuse to Johnson.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 51′ 36″.74. Longitude, 101° 45′ 38″.53.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Limestone Point	101 09 51.60	281 02 16.80	4.2669357
Bridge Creek	149 12 16.80	329 05 24.11	4.5039288
Cupola Syracuse schoolhouse	183 55 14.36	3 55 38.16	4.1405268
SE. corner sec. 24, T. 25 S., R. 41 W	358 03 01.16	178 03 01.61	2.7250593

BRIDGE CREEK, IN HAMILTON COUNTY.

In the SE. ¼ sec. 32, T. 22 S., R. 42 W., on the highest ground in the vicinity, near the head of the drainage of Bridge Creek, and about 5 miles northeast of the village of Coolidge.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 38° 06′ 25″.26. Longitude, 101° 56′ 49″.11.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Limestone Point	4 12 42.90	184 11 58.67	4.3783769
East Hill	28 48 24.34	208 43 15.64	4.4051115
Cheyenne Creek	116 29 05.35	296 24 36.99	4.0726964
NE. corner sec. 32, T. 22 S., R. 42 W	194 28 26.35	14 28 39.89	3.0162557

LIMESTONE POINT, IN HAMILTON COUNTY.

On a high rocky point in the NE. ¼ sec. 18, T. 25 S., R. 41 W., about 11 miles east of south from Coolidge.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 53′ 32″.20. Longitude, 101° 58′ 00″.94.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cheyenne Creek	163 07 06.19	343 03 22.72	4.4830921
Texas Trail	355 43 03.28	175 43 18.92	3.9191651
Butte Creek	60 47 26.58	240 41 44.63	4.1934811
Coolidge water-tower	168 12 29.98	348 10 59.50	4.2442019
E. ¼ corner sec. 18, T. 25 S., R. 41 W	280 20 58.67	100 21 22.11	2.6621244
East Hill	98 27 45.28	278 23 21.47	4.0256147

SILVER POLE, IN GRANT COUNTY.

Near the line between Grant and Kearny counties, Kansas, T. 27 S., R. 35 W., on the summit of the highest sand hill in the vicinity. The hill is of very loose sand, which rapidly changes shape from drifting.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 43′ 56″.77. Longitude, 101° 6′ 17″.46.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Spurgeon	45 22 37.73	225 19 00.63	4.0874600
Glazier	341 38 15.39	161 39 36.26	4.0126338
Sand Cone	102 25 36.64	282 19 45.03	4.1578350

ESTELLE, IN GRANT COUNTY.

In sec. 30, T. 28 S., R. 35 W., on the highest ground in the section.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 35′ 20″.71. Longitude, 101° 10′ 59″.11.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Spurgeon	166 09 54.34	346 09 09.58	3.8769631
Glazier	238 48 17.47	58 52 30.14	4.0742180

BLAND, IN GRANT COUNTY.

In the NE. ¼ sec. 12, T. 25 S., R. 38 W., on the highest ground in the vicinity.

Station mark: A stone post with bronze tablet marked "U. S. Geological Survey. B. M."

[Latitude, 37° 37′ 58″.08. Longitude, 101° 25′ 15″.65.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Appomattox	258 37 52.09	78 40 40.98	3.8377723
Prairie Pole	162 00 04.90	341 58 18.12	4.1406244

TEXAS TRAIL, IN HAMILTON COUNTY.

In sec. 2, T. 26 S., R. 43 W., on the highest ground in the vicinity.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 49′ 03″.68. Longitude, 101° 57′ 35″.60.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
East Hill	131 31 43.92	311 27 04.77	4.1714989
Limestone Point	175 43 18.92	355 43 03.28	3.9191651

SECONDARY POSITIONS OF POINTS NOT OCCUPIED.

Position.	Latitude.	Longitude.
GRANT COUNTY.		
	° ′ ″	° ′ ″
Ulysses, cupola of schoolhouse	37 34 21.1	101 19 31.1
Appomattox, church spire. (This building is used both as church and schoolhouse. It has been called by various names, but is near the old town site of Appomattox)	37 37 06.8	101 22 12.2
KEARNY COUNTY.		
Lakin, cupola of schoolhouse	37 56 30.7	101 15 27.0
Hartland, cupola of schoolhouse	37 53 21.1	101 22 03.5
HAMILTON COUNTY.		
Syracuse, cupola of schoolhouse	37 59 03.9	101 44 59.8
Chimney of schoolhouse, district 49	37 49 17.8	101 37 02.8
Coolidge, spire of water tower	38 02 49.3	102 00 29.0
NE. corner sec. 6, T. 27 S., R. 34 W	37 38 54.4	101 16 00.2
NW. corner sec. 36, T. 27 S., R. 36 W	37 39 38.7	101 12 58.8
NE. corner sec. 3, T. 28 S., R. 37 W	37 38 54.6	101 20 39.9
SW. corner sec. 27, T. 26 S., R. 38 W	37 45 01.3	101 28 19.3
NE. corner sec. 12, T. 25 S., R. 38 W	37 37 50.0	101 24 55.8
SW. corner sec. 22, T. 24 S., R. 38 W	37 56 36.1	101 28 02.2
E. ¼ corner sec. 29, T. 24 S., R. 38 W	38 00 56.4	101 35 47.3
NE. corner sec. 34, T. 25 S., R. 39 W	37 50 28.4	101 34 39.7
SW. corner sec. 25, T. 25 S., R. 40 W	37 50 23.7	101 40 02.8
NW. corner sec. 24, T. 22 S., R. 41 W	38 07 51.6	101 47 51.0
SE. corner sec. 24, T. 25 S., R. 41 W	37 51 18.5	101 45 37.8
E. ¼ corner sec. 18, T. 25 S., R. 41 W	37 53 29.5	101 57 41.4
NE. corner sec. 32, T. 22 S., R. 42 W	38 06 57.9	101 56 38.5

WYOMING.

An astronomic station was located at Sheridan, Wyoming, the pier for which is at the corner of Crook and Fourth streets, about 400 feet southeast of the Burlington depot. The computed latitude of this point is 44° 48′ 31″.10; probable error, ±0″.12. The longitude is 106° 56′ 45″.21; probable error, ±1″.16.

A base line was measured along the tangent of the Burlington and Missouri Railroad, beginning one-half mile west of Ranchester depot, and extending westward 1,350 feet beyond the end of the tangent. Adopted length, corrected for temperature and slope and reduced to mean sea level, is 20,994.316 feet. Logarithm of length, reduced to meters = 3.8061176. The difference of the two measurements was 0.025 foot. The triangulation was extended by Mr. W. S. Post westward as far as Heart Mountain, southward to Cloud Peak, northward to the Montana State line. Twenty-four stations in all were occupied, besides locating numerous secondary points.

Owing to the fact that Mr. Post was engaged in field work in Indian Territory until late in the spring, computations of positions for this work were not made in time to include with this report.

COLORADO.

The triangulation in eastern Colorado depends for distances and positions on the United States Coast and Geodetic Survey transcontinental triangulation, the stations Plateau, Big Springs, Square Bluff, Cramers Gulch, and Adobe of that scheme being the initial points. The following positions are from the work of Prof. A. H. Thompson for field seasons of 1894, 1895, and 1896.

CHEYENNE CREEK, IN PROWERS COUNTY.

On a hill west of Cheyenne Creek, in Prowers County, Colorado, about 6½ miles west of north from the village of Coolidge, Kansas.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 38° 09′ 16″.03. Longitude, 102° 04′ 03″.71.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bridge Creek	296 24 36.99	116 29 05.35	4.0726964
East Hill	3 23 09.92	183 22 28.83	4.4408068
130th boundary stone, Colorado-Kansas line	341 02 48.90	161 03 41.55	3.8060462

EAST HILL, IN PROWERS COUNTY.

About 11 miles west of south from Coolidge, Kansas, on the highest hill in the vicinity.

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 54′ 22″.62. Longitude, 102° 05′ 10″.43.]

To station.—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cheyenne Creek	183 22 28.83	3 23 09.92	4.4830921
Bridge Creek	208 43 15.64	28 48 24.34	4.4051115
Limestone Point	278 23 21.47	98 27 45.28	4.0256147
Texas Trail	311 27 04.77	131 31 43.92	4.1714989
Butte Creek	18 47 04.07	198 45 45.67	3.9868076
140th boundary stone, Colorado-Kansas line	215 16 25.57	35 18 00.93	3.8167774

BUTTE CREEK, IN PROWERS COUNTY.

In T. 26 S., R. 44 W., on the highest ground in the vicinity. (Range given from Land Office map of Kansas, 1891.)

Station mark: An iron post with brass cap marked "U. S. Geological Survey. B. M."

[Latitude, 37° 49′ 24″.71. Longitude, 102° 07′ 18″.04.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
East Hill	198 45 45.67	18 47 04.07	3.9868076
Limestone Point	240 41 44.63	60 47 26.58	4.1934811

TODDS POINT, IN OTERO COUNTY.

Thirteen miles east of Ordway, and 1 mile north of the Missouri Pacific Railway, on the extreme southern point of the mesa east of Horse Creek.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 38° 16′ 47″.54. Longitude, 103° 30′ 27″.77.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Rocky Butte	51 17 18.22	221 06 19.58	4.5960876
Nero Hill	97 10 48.38	277 00 45.13	4.3772949

ADOBE, IN LINCOLN COUNTY.

United States Coast and Geodetic Survey station, on one of the highest points of the bluffs west of the head of Adobe Creek. Some low, rounded ridges and hills are south and west.

Station mark: A stone sunk in the ground, with a cross cut in its upper face.

[Latitude, 38° 40′ 35″.56. Longitude, 103° 32′ 47″.47.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Square Bluffs	129 09 21.33	308 59 03.20	4.4871536
Cramer	74 10 17.88	253 55 10.02	4.5355535
Fody	42 56 43.28	222 54 34.30	3.8656933

FODY, IN LINCOLN COUNTY.

On the edge of the bluffs east of Horse Creek, 8 miles west of south from Fody's ranch, and about 9 miles east of south from Dyes Springs.

Station mark: A stone sunk in the ground, with a cross on its surface.

[Latitude, 38° 37′ 41″.26. Longitude, 103° 36′ 14″.21.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cramers Gulch	81 53 14.79	261 41 15.39	4.4493738
Antelope Mesa	45 22 41.18	225 11 36.44	4.5612199

COW BUTTES, IN OTERO COUNTY.

On the end of the mesa northeast of the tepee buttes, known as Cow Buttes, 19 miles east of north from Ordway and 6 miles south of east from Dyes Springs. The station is only a few miles north of the road leading from Antelope Springs to Moseley's ranch.

Station mark: A stone set in the ground, with a cross and the letters "U. S. G. S." marked on the surface.

[Latitude, 38° 27′ 26″.23. Longitude, 103° 37′ 02″.22.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fody	183 30 18.44	3 30 48.36	4.2787613
Nero	40 03 02.21	219 57 02.69	4.3397308
Lolita	355 15 46.98	175 17 02.34	4.5546178

NERO HILL, IN OTERO COUNTY.

About 6 miles a little east of north from Ordway, on the highest point of the hill.

Station mark: An iron bolt, 4 feet long, driven into the ground, with witness stones placed north, south, east, and west.

[Latitude, 38° 18′ 23″.04. Longitude, 103° 46′ 41″.26.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Todds Point	277 00 45.13	97 10 48.38	4.3772949
Rocky Butte	4 00 26.73	183 59 26.83	4.5196712
Apishapa Mesa	25 04 25.77	204 58 24.17	4.5273858

LOLITA, IN OTERO COUNTY.

On eastern part of a gently rounded hill, 9 miles northeast of Rocky Ford and 10 miles southeast of Ordway.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 38° 18′ 23″.04. Longitude, 103° 46′ 41″.26.

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Rocky Butte	54 54 15.71	234 46 05.85	4.3744440
Nero Hill	138 09 09.91	318 01 56.43	4.4068201
Todds Point	202 27 10.21	22 29 58.97	4.2396585

TIMPAS, IN OTERO COUNTY.

About 4 miles south of Timpas station, on the Atchison, Topeka and Santa Fe Railway. It is on the northeastern salient of the mesa, east of the railroad and about 2 miles from it.

Station mark: An iron bolt, marked "U. S. G. S.," driven into the rock, which here forms the surface of the mesa.

[Latitude, 37° 46′ 14″.90. Longitude, 103° 47′ 10″.24.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Taylor	20 16 55.33	200 13 27.43	4.3817990
Dry Bluff	75 06 13.48	354 56 09.76	4.3979048
Rocky Butte	176 37 56.61	356 37 16.88	4.4291913

ROCKY BUTTE, IN OTERO COUNTY.

On a butte 6 miles southwest of Rocky Ford, and one-half mile east of road leading from Rocky Ford. The station is on the extreme southwest corner of the summit of the butte.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 38° 00′ 44″.80. Longitude, 103° 48′ 14″.97.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Nero Hill	183 59 28.83	4 00 26.73	4.5146712
Todds Point	221 06 19.58	57 17 18.22	4.5960876
Timpas	356 37 16.88	176 37 56.61	4.4291913

SQUARE BLUFFS, IN LINCOLN COUNTY.

United States Coast and Geodetic Survey station on the north side of the valley of Horse Creek, on the bluffs about 150 feet above the valley, locally known as the "Square Bluffs." The Maryland Cattle Company's ranch is 6 miles south.

Station mark: A stone with a cross on the surface. Above this is a pile of rocks, with witness stones in cardinal directions. Underground mark, a bottle 3 feet below surface.

[Latitude, 38° 51′ 03″.08. Longitude, 103° 49′ 14″.73.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Big Springs	73 16 32.54	253 00 36.31	4.5852132
Adobe	308 59 03.20	129 09 21.33	4.4871536

TAYLOR BUTTE, IN LAS ANIMAS COUNTY.

In the northern part of Las Animas County, on an isolated hill at the eastern end of a mesa running east from Thatcher railroad station. It is about 14 miles east of Thatcher. The hill upon which the station is situated is a sort of double hill, the station being on the western half.

Station mark: An iron bolt, marked "U. S. G. S.," driven into the rock surface and stones piled over it.

[Latitude, 37° 34′ 01″.88. Longitude, 103° 52′ 50″.48.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Elephant Back..............	30 42 25.78	310 36 51.62	4.4228231
Thatcher....................	101 33 26.50	281 26 06.40	4.1388227
Timpas......................	200 13 27.43	20 16 55.33	4.3817990

ANTELOPE MESA, IN OTERO COUNTY.

About half a mile east of the road from Antelope Springs to the Mills ranch, on a low hill, and about 2½ miles directly north of West Antelope Springs and 11 miles south of the Mills ranch.

Station mark: A stone post with a bronze tablet bench-mark of the United States Geological Survey set in the upper surface.

[Latitude, 38° 23′ 50″.44. Longitude, 103° 54′ 02″.14.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cramers Gulch..............	174 39 59.61	354 39 07.75	4.3362751
Fody........................	225 11 36.44	45 22 41.18	4.5612199
Cow Buttes..................	254 51 26.85	75 02 06.77	4.4085667
Nero Hill...................	313 16 48.97	133 21 22.54	4.1677311
Rocky Butte.................	348 47 08.79	168 50 43.51	4.6389941
Apishapa Mesa..............	4 57 17.67	184 55 48.57	4.6102879

CRAMERS GULCH, IN LINCOLN COUNTY.

United States Coast and Geodetic Survey station, on a gentle ridge in the surface of the plateau about 3 miles north of the Russell or Mills ranch.

Station mark: A stone sunk in the ground, with a cross cut on its upper surface.

[Latitude, 38° 35′ 30″.87. Longitude, 103° 55′ 25″.46.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cow Buttes..................	299 07 06.27	119 18 33.41	4.4859896
Fody........................	261 41 15.39	81 53 14.79	4.4493738
Adobe.......................	253 55 10.02	74 09 17.88	4.5355535
Square Bluffs...............	197 16 23.19	17 20 15.09	4.4786843

APISHAPA MESA, IN OTERO COUNTY.

Near the southwest corner of the table-land known either as Apishapa Bluff or Apishapa Mesa, 7 miles west of north from Catlin.

Station mark: A square stone post, sunk 2 feet in the ground, with a cross and the letters "U. S. G. S." cut on its surface.

[Latitude, 38° 01′ 53″.21. Longitude, 103° 56′ 26″.46.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
English Arroyo	41 55 40.58	221 46 09.32	4.5319189
Dry Bluff	16 34 44.08	196 30 20.07	4.5672363
Timpas	331 47 20.68	154 53 02.38	4.5046289
Rocky Butte	279 56 20.28	100 01 22.88	4.0854412
Nero Hill	204 58 24.17	25 04 25.77	4.5273858
Sawtooth	77 11 54.08	256 54 43.06	4.6226730

SAND HILL, IN OTERO COUNTY.

Near the western line, on the southern of a small group of sand hills, 10 miles north of east from Boone and about 3 miles south of the road from Boone to Antelope Springs.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 38° 16′ 46″.98. Longitude, 104° 01′ 45″.53.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lankford	135 54 52.22	315 47 15.83	4.4087942
Dry Camp	192 38 08.82	12 39 22.99	4.1201212

DRY BLUFF, IN LAS ANIMAS COUNTY.

Near the corner of Otero and Pueblo counties, 19 miles southwest of Timpas railroad station on the Atchison, Topeka and Santa Fe Railway, and 4 miles south of the Timpas and Cuchara road. It is on the edge of a bluff facing south and west and overlooking a valley draining into the Apishapa River.

Station mark: An iron bolt driven into the rock and marked with the letters "U. S. G. S."

[Latitude, 37° 42′ 45″.33. Longitude, 104° 03′ 36″.54.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
North Rattlesnake Butte	100 48 58.07	280 34 45.60	4.5403471
Rocky Butte	214 01 04.33	34 10 29.88	4.6041052
Timpas	354 56 09.76	75 06 13.48	4.3979048
Taylor	315 28 43.53	135 35 19.99	4.3543371
Thatcher	8 24 23.25	188 23 37.11	4.1028737
South Rattlesnake Butte	94 41 56.99	274 27 48.68	4.5322606

THATCHER, IN LAS ANIMAS COUNTY.

On the extreme eastern end of a long, narrow mesa and about 4 miles north from Thatcher, a station on the Atchison, Topeka and Santa Fe Railway.

Station mark: An iron bolt driven into the rock surface and marked "U. S. G. S."

[Latitude, 37° 35′ 58″.66. Longitude, 104° 04′ 52″.05.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Timpas	233 46 20.70	53 57 09.80	4.5080593
Taylor Butte	281 26 06.40	101 33 26.50	4.1388227
Azimuth station	18 14 34.57	198 13 49.61	3.7620313
Herrons	3 05 33.82	183 05 15.40	4.1388227

HERRONS, IN LAS ANIMAS COUNTY.

Six and one-half miles north of east from Tyrone and 6 miles south of Thatcher, stations on the Atchison, Topeka and Santa Fe Railway. The station is at the southern extremity of the mesa.

Station mark: A stone sunk in the ground, with an iron bolt marked with a cross and the letters "U. S. G. S." set in its surface.

[Latitude, 37° 28′ 32″.77. Longitude, 104° 05′ 22″.29.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Thatcher	183 05 15.40	3 05 33.82	4.1388227
Taylor Butte	241 08 41.87	61 16 19.78	4.3235725
Elephant Back	338 28 05.87	158 30 08.87	4.1326846
Fishers Peak	37 38 54.68	....	4.7423883

ADAIR BUTTE, IN LAS ANIMAS COUNTY.

About 1 mile west of north from Adair railroad station, on the Denver, Texas and Fort Worth Railroad. The butte is a lava cone, rising about 200 feet above the general level of the valley. The station is on the apex of the butte.

Station mark: A copper bolt set in the rock and marked "U. S. G. S. ◬"

[Latitude, 37° 05′ 07″.02. Longitude, 104° 06′ 31″.25.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fishers Peak	92 32 23.44	272 19 54.29	4.4872249
Earl Mesa	151 23 07.05	331 15 47.88	4.5715691
Herrons	182 14 20.91	2 15 02.68	4.6371750
Taylor Butte	200 37 44.55	20 46 02.21	4.7571742

ENGLISH ARROYO, IN PUEBLO COUNTY.

Near the southeast corner of Pueblo County, 2 miles north of the Timpas and Cuchara road, 3½ miles south of English Spring and 5 miles a little north of west from the ford on Apishapa River, on a small, partly detached mesa in the general line of cliff-like mesas having a sharp escarpment facing west. The station is not on the extreme southern salient of the mesa, but on a smaller salient farther east.

Station mark: A stone sunk in the ground, with an iron bolt marked by a cross and the letters "U. S. G. S."

[Latitude, 37° 48′ 10″.87. Longitude, 104° 11′ 56″.09.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Rocky Butte	236 04 41.02	56 19 14.18	4.6209727
Timpas	275 29 26.96	95 44 37.38	4.5626848
Dry Bluff	309 20 10.32	129 25 16.21	4.1992116
South Rattlesnake Butte	71 26 51.79	251 17 48.73	4.3598314
North Rattlesnake Butte	80 44 03.61	260 34 56.37	4.3455288
Sawtooth	131 16 40.71	311 09 03.02	4.3841773

DRY CAMP, IN EL PASO COUNTY.

United States Coast and Geodetic Survey station, near the southeastern corner of El Paso County, a few rods north of the road leading from Lankford's ranch to Sanborn post-office; 14 miles from Lankford, 21 miles from Sanborn; on a low, rounded hill, the highest in the immediate vicinity.

Station mark: A stone set in the ground, with a copper bolt marked "U. S. G. S."

[Latitude, 38° 33′ 40″.76. Longitude, 104° 12′ 02″.78.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Big Springs	169 41 45.83	349 40 07.15	4.3289318
Cramers Gulch	261 54 30.38	82 04 52.27	4.3870187
Sand Hill	334 23 14.29	154 29 37.57	4.5396969
Butler Butte	9 05 20.23	189 02 00.54	4.6958378
Lankford	12 39 22.99	192 38 08.82	4.1201212

LANKFORD, IN PUEBLO COUNTY.

In the northeastern part of Pueblo County, 7 miles northeast of Lankford's ranch, on the summit of the highest sand ridge in the vicinity.

Station mark: A stone sunk in the ground, with a copper bolt marked "U. S. G. S." set in its surface.

[Latitude, 38° 26′ 43″.48. Longitude, 104° 14′ 01″.92.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dry Camp	192 38 08.82	12 39 22.99	4.1201212
Sand Hill	315 47 15.83	135 54 52.22	4.4087942
Butler Butte	7 46 48.84	187 44 43.20	4.5621659

BIG SPRINGS, IN EL PASO COUNTY.

United States Coast and Geodetic Survey station, 4 miles southwest of the Galloway ranch and 6 miles north of the Hancock ranch, on a high bluff-edge facing west, the highest ground in the vicinity.

Station mark: A stone sunk in the ground, with a cross cut in its surface.

[Latitude 38° 45′ 01″.22. Longitude 104° 14′ 40″.76.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Square Bluffs	253 00 36.31	73 16 32.54	4.5852132
Cramer	302 05 55.32	122 17 57.21	4.5185796
Tolles Hill	18 54 44.67	198 50 57.12	4.4352090

BUTLER BUTTE, IN PUEBLO COUNTY.

About 4 miles northeast of Undercliff post-office, on the highest part of the most eastern of a group of small mesas.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 38° 07′ 10″.87. Longitude, 104° 17′ 24″.71.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sand Hill	232 01 57.93	52 11 38.10	4.4612662
Huerfano Cliff	63 04 36.79	242 56 45.96	4.3197647
Greenhorn Mountain	67 14 46.69	246 48 22.17	4.8337123
San Carlos	101 53 30.98	281 38 30.39	4.5593827
Badger Hill	128 20 20.39	308 17 01.29	4.0001270
John Palmer	126 03 11.59	305 44 43.37	4.7298950

EARL MESA, IN LAS ANIMAS COUNTY.

About 4 miles northwest of Earl station, on the Atchison, Topeka and Santa Fe Railway. It is on the northern edge of a salient in the bluff overlooking a valley to the north.

Station mark: A stone set in the ground, with a copper bolt marked "U. S. G. S."

[Latitude, 37° 22′ 48″.10. Longitude, 104° 18′ 37″.18.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fishers Peak	22 06 07.01	202 00 54.33	4.5300972
West Spanish Peak	89 35 16.91	269 10 44.82	4.7757254
East Spanish Peak	91 36 39.20	271 14 44.70	4.7265200
Thatcher	219 40 48.75	39 49 10.94	4.5010630
Herrons	241 23 59.38	61 32 02.48	4.3472395

CONE, IN LAS ANIMAS COUNTY.

In the northwestern part of the county, on the northern end of a small outlying mesa east of the main mesa, about 13½ miles west of Thatcher railroad station, on the Atchison, Topeka and Santa Fe Railway. It is the eastern of two small mesas.

Station mark: A stone set in the ground, with an iron bolt marked "U. S. G. S." on its upper surface.

[Latitude, 37° 33′ 00″.35. Longitude, 104° 19′ 32″.79.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
North Rattlesnake Butte ...	156 26 38.26	336 21 11.60	4.4266886
English Arroyo	201 41 47.08	21 46 26.19	4.4803715
Dry Bluff	232 20 51.28	52 30 35.17	4.4710688
Thatcher	355 38 37.79	75 47 34.94	4.3483049
Earl Mesa	355 51 52.21	175 52 25.95	4.2769487

BADGER HILL, IN PUEBLO COUNTY.

About 5 miles north of Undercliff post-office, on the most southern of a small group of mesas.

Station mark: A stone sunk in the ground, with an iron bolt marked "U. S. G. S." set in its surface.

[Latitude, 38° 10′ 31″.99. Longitude, 104° 22′ 47″.06.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Plateau	148 36 25.84	328 30 13.35	4.4473303
Huerfano Cliff	34 28 08.59	214 23 36.37	4.2789243

SAWTOOTH, IN PUEBLO COUNTY.

In the southeastern part of the county, on a salient in the line of cliffs overlooking a valley draining into Huerfano River, 1 mile west of a road leading from Rattlesnake Buttes to Undercliff. The station is not on the highest point of the salient, but on an angle about 300 feet east, and 20 feet lower than highest point on salient.

Station mark: An iron bolt driven into the ground.

[Latitude, 37° 56′ 48″.48. Longitude, 104° 24′ 21″.58.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Windmill	294 29 00.28	114 31 23.06	3.7954865
Turkey Ridge	60 47 45.78	240 38 17.89	4.4133265

NORTH RATTLESNAKE BUTTE, ON HUERFANO–LAS ANIMAS COUNTY LINE.

On the extreme north end of the butte.

Station mark: A cairn about 4 feet high, of broken stone and likely to be torn down, but easily determined by being on extreme north end.

Underground mark, an iron bolt.

[Latitude, 37° 46′ 14″.27. Longitude, 104° 26′ 49.″22.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South Rattlesnake Butte....	257 29 22.37	117 29 27.17	3.5711227
East Spanish Peak	44 27 50.27	224 10 50.52	4.7687785
Unfug Crag	58 04 15.27	237 50 41.86	4.5851352
Walsenburg church spire ...	60 00 26.77	239 58 24.02	4.5815969
Walsen Crag	63 42 59.27	243 29 32.66	4.5572146
Huerfano Butte	86 36 42.67	266 23 04.28	4.5155140
Greenhorn Mountain.........	104 04 05.67	283 43 34.95	4.7038446
Turkey Ridge	109 58 34.97	289 50 38.77	4.3056742
Sawtooth	190 26 43.97	10 28 14.58	4.2984936
Windmill Pole	208 41 49.27	28 45 41.62	4.2865630

FISHERS PEAK, IN LAS ANIMAS COUNTY.

On the north end of the high mesa known as Fishers Peak.

Station mark: A stone monument about 9 feet high on the extreme north end of the mesa.

[Latitude, 37° 05′ 49″.15. Longitude, 104° 27′ 13″.55.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Taylor	224 03 00.78	44 23 51.90	4.8622592
Thatcher....................	210 30 30.24	30 44 04.10	4.8117461
Apishapa Crag	173 22 31.23	353 20 46.90	4.5649446
East Spanish Peak...........	128 59 45.98	308 43 08.09	4.7175308
West Spanish Peak...........	123 20 46.07	303 01 31.18	4.7498447
Lone Rock	84 49 37.98	264 34 08.04	4.5825061

APISHAPA CRAG, IN LAS ANIMAS COUNTY.

On the extreme summit of a ridge-like lava butte, 4 miles east of Apishapa railroad station, on the Denver and Rio Grande Railroad, and north of the wagon road running east from that station.

Station mark: A copper bolt set in the rock and marked "U. S. G. S."

[Latitude, 37° 25′ 32″.42. Longitude, 104° 30′ 05″.88.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fishers Peak	253 20 46.90	173 22 31.23	4.5649496
Earl Mesa	286 35 35.97	106 42 34.31	4.2474918
Herrons	261 12 22.53	81 27 24.68	4.5668810
Cone	228 21 20.87	48 27 51.31	4.3180284
East Spanish Peak; SW. monument	84 14 36.17	263 54 44.50	4.5622507

HUERFANO CLIFF, IN PUEBLO COUNTY.

Near the line of Huerfano County and about 8 miles southwest of Undercliff post-office, on a salient in the line of cliffs overlooking the valley of Huerfano River.

Station mark: A stone sunk in the ground, with an iron bolt marked "U. S. G. S." set in the surface.

[Latitude, 38° 02′ 03″.52. Longitude, 104° 30′ 08″.16.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Badger Hill	214 23 36.37	34 28 08.59	4.2789243
Butler Butte	242 56 45.96	63 04 36.79	4.3197647

PLATEAU, IN PUEBLO COUNTY.

United States Coast and Geodetic Survey station, 9 miles east of north from Pueblo, on the highest point of a mesa overlooking the valley of Fountain Creek.

Station mark: A stone post set in the ground, with a cross cut on its surface.

[Latitude, 38° 23′ 27″.06. Longitude, 104° 32′ 48″.28.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Big Springs	213 19 13.74	33 30 31.78	4.6794899
Dry Camp	237 48 51.43	58 01 46.35	4.5518227
Lankford	257 24 20.71	77 36 00.62	4.4469672
Butler Butte	323 11 42.85	143 21 14.69	4.5746361
Badger Hill	328 20 13.35	148 36 25.84	4.4473303
Greenhorn Mountain	35 27 06.85	215 10 08.23	4.8419856
San Carlos	29 48 29.59	209 42 58.56	4.4175523
John Palmer	93 50 39.05	273 41 41.56	4.3231381

TURKEY RIDGE, IN HUERFANO COUNTY.

Near the western end of a line of bluffs overlooking a valley draining into Cuchara River. The line of bluffs is known locally as Turkey Ridge. The station is about 150 feet south of the edge of the bluff.

Station mark: Iron bolt driven into the ground.

[Latitude, 37° 49′ 57″.56. Longitude, 104° 39′ 46″.14.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Walsen Crag	30 07 27.77	210 01 56.02	4.4230701
Greenhorn	100 01 39.87	279 49 04.97	4.4846984
Sawtooth	240 38 17.89	60 47 45.78	4.4133265

SAN CARLOS, IN PUEBLO COUNTY.

About 7 miles southwest of Pueblo, on the southern end and highest part of an irregular mesa.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 38° 11′ 10″.68. Longitude, 104° 41′ 42″.53.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Plateau	209 42 58.558	29 48 29.586	4.4175523
Willow Creek	124 42 49.118	304 32 04.308	4.4879643
Curley	106 01 57.658	285 39 51.201	4.7334970

JOHN PALMER, IN PUEBLO COUNTY.

About 14 miles northwest of Pueblo, on a low hill on the ridge overlooking the valley of Horse Creek.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 38° 24′ 11″.93. Longitude, 104° 47′ 13″.63.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
San Carlos	341 30 01.763	161 33 26.958	4.4047778
Willow Creek	69 04 27.223	248 57 06.438	4.2662410
Fremont Peak	96 33 57.673	276 15 59.538	4.6268121

WALSEN CRAG IN HUERFANO COUNTY.

On the highest part of a high volcanic dike 2½ miles west of Walsenburg. The station is a large isolated rock.

Station mark: A cross cut on the surface of the rock.

[Latitude, 37° 37′ 34″.06. Longitude, 104° 48′ 48″.28.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
East Spanish Peak, N. and E. monument	18 29 18.76	198 25 43.85	4.4374223
Greenhorn	149 09 37.16	329 02 35.24	4.5165499
Huerfano Butte	178 16 17.56	358 16 06.98	4.1474567
Walsenburg church spire	277 42 55.66	97 44 29.29	3.5792920
Unfug Crag	3 45 43.76	183 45 36.61	3.6416570

WILLOW CREEK, IN FREMONT COUNTY.

About 7 miles southeast of Florence, on the northeastern salient of the mesa between Hardscrabble and Red creeks.

Station mark: An iron bench-mark post of the United States Geological Survey.

[Latitude, 38° 20′ 37″.49. Longitude, 104° 59′ 03″.68.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
San Carlos	304 32 04.308	124 42 49.118	4.4879643
Lone Tree	49 03 09.458	228 55 44.825	4.3637186
Curley	84 21 18.458	264 09 55.451	4.4294652
Fremont Peak	114 36 35.358	294 25 58.910	4.4366801
10,050 Mountain	94 01 38.458	273 49 39.698	4.4501380

LONE TREE, IN CUSTER COUNTY.

Six miles west of Greenwood post-office, on a low hill on the summit ridge of the Wet Mountain Range, at the head of Adobe Creek.

Station mark: A copper bolt marked "U. S. G. S.," set in the rock forming the surface of the hill.

[Latitude, 38° 12′ 25″.76. Longitude, 105° 11′ 00″.99.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Clarence	342 19 29.82	162 22 17.53	4.3390581
Deer Peak	358 08 07.22	178 08 22.49	4.2682514
Round Mountain	71 10 04.22	251 01 26.79	4.3332154
Lead Mountain	10 35 19.82	190 35 10.70	3.2852347

LEAD MOUNTAIN, IN CUSTER COUNTY.

Five miles southwest of Greenwood post-office, on the summit ridge of the Wet Mountain Range, overlooking the canyon of Hardscrabble Creek.

Station mark: A copper bolt set in the rock forming the summit.

[Latitude, 38° 11′ 24″.28. Longitude, 105° 11′ 15″.57.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Curley	148 01 28.10	327 57 39.41	4.2290294
Lone Tree	190 35 10.70	10 35 19.82	3.2852347

FREMONT PEAK, IN FREMONT COUNTY.

Two miles west of Canyon, on the middle one of three crags forming the summit of the mountain known as Fremont Peak.

Station mark: A copper bolt marked "U. S. G. S.," set in the rock forming the summit of the crag.

[Latitude, 38° 26′ 45″.41. Longitude, 105° 16′ 08″.40.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lone Tree	344 14 22.81	164 17 32.72	4.4399195
Curley	7 32 45.21	187 31 57.72	4.1509041
10,050 Mountain	19 09 40.81	198 58 49.59	3.9881206

CURLEY, IN FREMONT COUNTY.

About 9 miles south of Canyon, on a rocky crag on the summit ridge of the Wet Mountain Range, and overlooking the canyon of Grape Creek.

Station mark: A copper bolt marked "U. S. G. S.," set in a large bowlder forming the summit of the crag.

[Latitude, 38° 19′ 10″.30. Longitude, 105° 17′ 24″.92.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
San Carlos	285 39 51.20	106 01 57.66	4.7334970
Lone Tree	323 09 28.05	143 13 25.82	4.1925327
Lead Mountain	327 57 39.41	148 01 28.10	4.2290294
Deer Peak	342 10 47.01	162 14 59.70	4.5127593
Round Mountain	29 34 45.81	209 30 05.34	4.3494206
10,050 Mountain	163 17 33.45	343 17 29.89	3.6832193

SECONDARY POSITIONS OF POINTS NOT OCCUPIED.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Elephant Back, south side Van Bremer Ravine.	37 21 43.2	103 01 59.9
Rocky Ford schoolhouse cupola	38 02 35.7	103 42 40.5
Windmill Point	37 55 24.5	104 20 28.9
Tolles Hill	38 31 05.3	104 20 45.2
South Rattlesnake Butte	37 44 13.6	104 26 42.9
Unfug Crag	37 35 12.2	104 49 00.0
Huerfano Butte	37 45 09.3	104 49.06.0
Lone Rock, 4 miles south of Weston post-office.	37 03 54.5	104 52 55.0
East Spanish Peak, S. monument	37 23 31.2	104 54 42.1
Ordway, cupola on elevator	38 12 42.2	104 54 41.9
West Spanish Peak	37 22 27.3	104 59 02.1
Greenhorn Mountain	37 52 48.0	105 00 16.9

TEXAS.

SPOFFORD ASTRONOMIC STATION.

This station was located at Spofford, Texas, the pier being in lot 9, block 20, facing the railroad reservation, 258 feet northward from the track and 426 feet north-northwest of the water tank.

The computed position of this station is: latitude 29° 10′ 27″.23; probable error, ± 0″.15; longitude, 100° 24′ 36″.09; probable error, ± 0″.43.

A base line was measured along the tangent of the Galveston, Harrisburg and San Antonio Railroad, passing through Spofford, beginning about 500 feet eastward from the eastern end of the tangent, 5,700 feet east of Spofford depot, and extending westward about 3 miles. The adopted length for this line, after correcting for slope and temperature and reduction to sea level, is 21,001.825 feet. The two measurements of the line differed 0.039 foot.

Triangulation from the Spofford base in the winter of 1896–97, by Mr. H. L. Baldwin, jr.

Average error of closure of 28 triangles used is 1″.40. Maximum error, 3″.39.

WATER TANK, IN KINNEY COUNTY.

One-quarter mile east of the Galveston, Harrisburg and San Antonio Railroad station at Spofford, Kinney County. Located by direct measurement from the United States Geological Survey astronomic pier at Spofford, and connected by angulation with the triangulation by Mr. Baldwin.

[Latitude, 29° 10′ 23″.14. Longitude, 100° 24′ 34″.94.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Las Moras..................	186 00 19.36	6 00 58.09	4.3101867
West base..................	124 55 17.64	304 54 05.18	3.6898310

EAST BASE, IN KINNEY COUNTY.

East of Spofford depot 5,700 feet, on northern side of railroad track, on prolongation of line of northern rail of tangent.

Station mark: An iron bench-mark post set 3½ feet in the ground.

[Latitude, 29° 09′ 55″.50. Longitude, 100° 23′ 48″.98.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
West base..................	124 48 33.24	304 46 58.38	3.8062730
Las Moras..................	182 25 39.95	2 25 56.21	4.3260065

WEST BASE, IN KINNEY COUNTY.

On high ground just west of the summit of grade, nearly opposite the ninth telegraph pole west of milepost 345 of the Galveston, Harrisburg and San Antonio Railroad.

Station mark: Iron bench-mark post set 3 feet in the limestone rock, 39 feet northward from the north rail.

[Latitude, 29° 11′ 54″.15. Longitude, 100° 27′ 03″.54.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Las Moras..................	199 20 05.96	19 21 57.37	4.2685868
Spofford (water tank)	304 54 05.18	124 55 17.64	3.6898310

LAS MORAS, IN KINNEY COUNTY.

A prominent volcanic mountain 4 miles northerly from Fort Clark, or Brackett, in Kinney County. Station is about 15 feet south of a large rock cairn which marks the position of point located in triangulation of 1892.

Station mark: Iron bench-mark post set 40 inches in ground.

[Latitude, 29° 21′ 22″.94. Longitude, 100° 23′ 15″.71.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Palmer	331 57 20.13	151 58 45.28	3.9993605
West base	19 21 57.37	199 20 05.96	4.2685868

PALMER, IN KINNEY COUNTY.

Six miles east of Brackett, on a small hill south of the Brackett-Uvalde road.

Station mark: Iron bench-mark post set 40 inches in the ground.

[Latitude, 29° 16′ 36″.67. Longitude, 100° 20′ 21″.80.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Las Moras	151 58 45.28	331 57 20.13	3.9993605
West base	51 18 21.45	231 15 06.23	4.1431731

ANACACHO, IN KINNEY COUNTY.

Near the west end of the Anacacho Mountains, three-quarters of a mile south of the Galveston, Harrisburg and San Antonio Railroad.

Station mark: A copper bolt leaded into the limestone rock and stamped "U. S. G. S. △"

[Latitude, 29° 11′ 04″.13. Longitude, 100° 17′ 12″.95.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Las Moras	152 49 12.17	332 46 14.80	4.3308484
West base	95 33 09.23	275 28 21.18	4.2049307

TURKEY, IN KINNEY COUNTY.

On the highest point of the large vocanic peak locally known as Turkey Mountain, about 15 miles northeast of Brackett.

Station mark: $\overset{\text{U.S.}}{\underset{\text{G.S.}}{+}}$ cut in the rock.

[Latitude, 29° 22′ 21″.92. Longitude, 100° 11′ 57″.88.]

To station.—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Las Moras	84 22 26.42	264 16 54.04	4.2641564
Anacacho	22 11 44.16	202 09 10.07	4.3528426

CLINE, IN KINNEY COUNTY.

About 1 mile southwest of the northeast end of the Anacacho Mountains. Same point occupied in triangulation of 1892.

Station mark: Iron bench-mark post set 40 inches in the ground.

[Latitude, 29° 11′ 58″.64. Longitude, 100° 08′ 30″.10.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Las Moras	126 04 03.49	305 56 50.38	4.4705967
Anacacho	83 15 38.29	263 11 23.28	4.1530510

ALLEN, IN UVALDE COUNTY.

On a prominent volcanic hill 12 miles west of Uvalde.

Station mark: An iron post set 40 inches in the ground.

[Latitude, 29° 12′ 04″.73. Longitude, 99° 58′ 32″.38.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Las Moras	113 19 51.76	293 07 46.32	4.6392123
Sycamore	186 28 19.88	6 29 21.21	4.4760102

SYCAMORE, IN UVALDE COUNTY.

Easternmost of two prominent peaks on the east side of Sycamore Creek, about 5 miles above its junction with the Nueces River.

Station mark: A copper bolt leaded into the limestone rock and marked "U. S. G. S. △"

[Latitude 29° 28′ 10.″44. Longitude, 99° 56′ 27.″.20.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Las Moras	73 58 24.23	253 45 14.28	4.6545701
Anacacho	46 51 12.62	226 41 02.45	4.6639970

FLOREA, IN UVALDE COUNTY.

On second range of hills easterly from the Rio Frio; 2 miles northeasterly from the "Shut-in" ranch.

Station mark: A copper bolt leaded into the limestone ledge, marked "U. S. G. S. △"

[Latitude, 29° 30′ 51″.59. Longitude, 99° 40′ 04″.18.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sycamore	79 27 18.09	259 19 14.15	4.4304123
Allen	40 49 24.13	220 40 20.81	4.6608146

BLUE MOUNTAIN, IN UVALDE COUNTY.

The easternmost of two prominent volcanic mountains about 1 mile north of railroad at Elliott's ranch, 9 miles northeasterly from Uvalde.

Station mark: A copper bolt set with Portland cement between several large rocks.

[Latitude, 29° 18′ 12″.73. Longitude, 99° 40′ 00″.03.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Florea	179 43 33.19	359 43 31.15	4.3685525
Allen	69 24 28.97	249 15 25.41	4.5065076

PETERS, IN UVALDE COUNTY.

On a prominent hill about 1½ miles northeasterly from Peters ranch, in Blanco Canyon.

Station mark: A copper bolt cemented with sulphur in the limestone rock 100 feet southwesterly from the summit of the hill, reference point consisting of an arrow cut in flat limestone, 19.9 feet distant; true azimuth from station to mark, 182° 06′.

[Latitude, 29° 30′ 47″.58. Longitude, 99° 35′ 18″.14.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Blue Mountain	18 07 39.20	198 05 20.78	4.3883075
Florea	90 56 16.13	270 53 55.21	3.8867631

UTAH.

Tintic Mining Region.

Three primary stations of the United States Coast and Geodetic Survey, viz, Mount Nebo, Scipio, and Deseret, were used; positions of new stations were computed by the three-point method by Mr. S. S. Gannett.

MOUNT NEBO (SOUTH SUMMIT).

A noted mountain on the line between Juab and Sanpete counties; United States Coast and Geodetic Survey station.

[Latitude, 39° 48′ 32″.92. Longitude, 111° 46′ 02″.13.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Scipio	39 20 51.49	219 04 00.06	4.7773522

SCIPIO, IN MILLARD COUNTY.

The station is located on the highest peak in the northeastern portion of Millard County; United States Coast and Geodetic Survey station.

[Latitude, 39° 23′ 28″.18. Longitude, 112° 12′ 28″.87.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Nebo	219 04 00.06	39 20 51.49	4.7773522

DESERET, IN TOOELE COUNTY.

On the summit of the highest peak of the Onoqui Mountains; United States Coast and Geodetic Survey station.

[Latitude, 40° 27′ 29″.00. Longitude, 112° 37′ 37″.70.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Nebo	314 14 06.52	134 47 21.89	5.0118781

MAMMOTH PEAK, IN JUAB COUNTY.

The highest summit in the Tintic mining region, Juab County, one-half mile east of the Mammoth mine.

Station mark: A small rock cairn on the highest part of the summit.

[Latitude, 39° 55′ 49″.04. Longitude, 112° 06′ 16″.25.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Robinson	49 45 58.9	229 45 18.2	3.29450
Eureka Peak	127 59 46.2	307 59 12.8	3.19503
Deseret	142 57 14.1	322 36 59.9	4.8667837
Nebo	294 53 02.2	115 06 00.5	4.5029146
Sunrise Peak	350 46 26.2	170 46 57.3	3.86071
Scipio	8 28 26.3	188 24 28.5	4.7818458

SIOUX PEAK, IN JUAB COUNTY.

A high summit in the Titanic mining region, Juab County, three-fourths of a mile northeast of Mammoth and 2 miles by trail southeast of Eureka.

Station mark: A small rock cairn on highest part of summit.

[Latitude, 39° 56′ 01″.87. Longitude, 112° 06′ 07″.85.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Scipio	8 36 21.2	188 32 18.0	4.7848577
Mammoth Peak	26 44 20.6	206 44 15.2	2.64700
Eureka Peak	111 36 30.3	291 35 51.5	3.18847
Deseret	142 38 39.5	322 18 22.5	4.8656320
Nebo	295 40 58.7	115 53 51.7	4.5027639
Sunrise	352 44 10.5	172 44 36.2	3.88193

EUREKA PEAK, IN JUAB COUNTY.

A steep rock summit in the Tintic mining region, Juab County, 1 mile south of Eureka.

Station mark: A copper bolt in solid rock on highest part of the summit, above which is a small rock cairn.

[Latitude, 39° 56′ 20″.31. Longitude, 112° 07′ 08″.27.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Robinson	6 50 03.2	186 49 56.0	3.35280
Sunrise	343 32 21.2	163 33 26.0	3.92813

ROBINSON, IN JUAB COUNTY (not occupied).

The point located is a flag pole on the highest part of a ridge one-half mile southeast of Robinson depot, Juab County.

[Latitude, 39° 55′ 07″.78. Longitude, 112° 07′ 19″.58.]

SUNRISE PEAK, IN JUAB COUNTY.

A rounded, rocky summit on southern border of Tintic mining region, Juab County, 2 miles south of Silver City.

Station mark: A small rock cairn on highest part.

[Latitude, 39° 51′ 56″.86. Longitude, 112° 05′ 27″.45.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Scipio	10 50 06.8	190 45 38.0	4.7295392
Deseret	145 23 16.7	325 02 31.8	4.9034679
Robinson	155 37 58.4	335 36 46.3	3.81063
Nebo	282 41 07.6	102 53 34.1	4.4535193

IDAHO.

MICA PEAK, IN KOOTENAI COUNTY.

A prominent bald summit of the Mica Mountains in Kootenai County, Idaho, 20 miles east of Spokane, Washington, and 3 miles east of the Washington-Idaho State line. A wagon road leads to the foot of the mountain on the west side, and there is a good trail to the station.

Station mark: A copper bolt set 4 inches into the ledge on the highest part of the summit. Above the bolt is a cairn of rocks 4 feet in diameter and 5 feet in height.

[Latitude, 47° 37′ 19″.26. Longitude, 116° 59′ 21″.04.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Moran	83 38 50.36	263 25 05.73	4.3704939
Little Baldy	110 13 20.40	289 58 08.50	4.4378498

WASHINGTON.

The triangulation of the United States Geological Survey in Washington is in two detached areas, the work of 1895 starting from a base and astronomic position in the vicinity of Ellensburg and extending into the Cascade Mountains; that of 1896 starting from a base and astronomic position near Spokane and extending eastward to the Idaho State line. All of the field observations connected with this work were made by Mr. S. S. Gannett, excepting the longitude of the Spokane pier, which was determined by the United States Coast and Geodetic Survey.

The average closure error of all triangles in these two schemes is 2″.2.

ELLENSBURG ASTRONOMIC STATION.

The pier for this station is located in the grounds of the State Normal School, 173 feet west of the center of the tower of the school building. The computed latitude for this station is 46° 59′ 55″.03; probable error, ±″.09; longitude, 120° 32′ 25″.25.

A base line about 4 miles in length was measured along the tangent of the Northern Pacific Railway, beginning one-half mile northwest of Ellensburg depot. The adopted length, corrected for temperature and slope and reduced to sea level, is 21982.371 feet. The two measurements of the line differed .002 foot.

NORMAL SCHOOL, IN KITTITAS COUNTY.

The tower of the normal school building was located by direct measurement from the astronomic pier of 1895 and connected with the stations of the base expansion by triangulation.

The point located is the center of the tower, which is 173 feet east of the astronomic pier.

[Latitude, 46° 59′ 55″.03. Longitude, 120° 32′ 22″.85.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Southeast base	90 47 43.69	270 46 53.10	3.16492

SOUTHEAST BASE, IN KITTITAS COUNTY.

This base is located one-half mile northwest of the Ellensburg depot. It begins on the switch, 209.4 feet southeast of the switch post. The signal is located 64.1 feet northeastward, and at right angles to tangent. The instrument was elevated 10 feet.

Station mark: A dressed stone, 8 inches square on top, set 30 inches in the ground and marked U. S. ● BASE.

Reference marks: Two stone posts, 36 inches long, dressed, 6 inches square on upper end, set 2½ feet in ground on side away from railroad; distance from center of station to nearest edge of reference posts, 23.3 feet and 50.1 feet.

[Latitude, 46° 59′ 55″.69. Longitude, 120° 33′ 32″.04.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Manastash (1)	54 17 27.21	234 12 53.34	3.9893250
Taneum	123 55 36.97	303 46 48.05	4.2641000
Northwest base.............	135 05 12.00	315 02 28.06	3.8260856
Reeser	174 29 18.45	354 28 03.28	4.3519351
Normal school	270 46 53.10	90 47 43.69	3.16492

REESER, IN KITTITAS COUNTY.

On a partly cleared summit on the southern edge of the timbered plateau bounding the Kittitas Valley on the north, and near the head of Reeser Creek. A wagon road follows up the left side of the creek to a herder's cabin, which is within one fourth mile of the station. The station is at the edge of the timber, and commands a view of the valley southward and westward, but not to the north.

Signal: A tall pine tree, trimmed.

Station mark: $\overset{\text{U. S.}}{\underset{\text{G. S.}}{\triangle}}$ cut on south side of tree, 3 feet above ground.

[Latitude, 47° 12′ 00″.49. Longitude, 120° 35′ 14″.66.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Aix	48 29 26.35	228 00 13.2	4.8318335
Rainier	66 53 01.00	246 01 38.0	4.9870500
Chimney	122 57 53.70	302 27 00.4	4.7982900
Stuart	142 17 16.64	322 03 29.8	4.5853741

NORTHWEST BASE, IN KITTITAS COUNTY.

About 4½ miles northwest of Ellensburg. The center of station is 42.1 feet northeast of and at right angles to western rail of track, and just south of wagon road, on a section line. The instrument was elevated 30 feet.

Station mark: Stone marked "+ U. S. Base" on dressed upper surface and set 2½ feet in ground.

Reference mark: A stone post 36 inches long, dressed, 6 inches square on upper end, set 2½ feet in ground. Distance from center of station to nearest edge of reference post, 7.33 feet.

[Latitude, 47° 02′ 29″.28. Longitude, 120° 37′ 16″.13.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Manastash (1)	16 57 23.40	196 55 33.31	4.0381038
Taneum	117 36 28.50	297 30 23.46	4.0743483
Reeser	188 14 48.36	8 16 17.37	4.2510219
Southeast base	315 02 28.06	135 05 12.00	3.8260856

MANASTASH (1), IN KITTITAS COUNTY.

On a high bunch-grass ridge just south of Manastash Creek, and 8 miles by wagon road southeast from Ellensburg. The ridge is very steep on the northern edge, but slopes gradually toward the south. Toward the west it rises so that the view is cut off in that direction.

Station mark: A dressed stone 8 inches square on top, set 30 inches in the ground, and marked "U. △ S."

[Latitude, 46° 56′ 51″.10. Longitude, 120° 39′ 46″.68.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Manastash (2)	63 42 21.00	243 41 37.00	3.1511100
Mount Aix	69 22 46.69	248 56 55.69	4.6826720
Stuart	163 02 08 85	342 51 43.33	4.7865804
Reeser	191 31 21.04	11 34 40.22	4.4573294

MANASTASH (2), IN KITTITAS COUNTY.

On Manastash Ridge, 1 mile west of Manastash (1) and 100 feet higher, and about 9 miles southeast of Ellensburg. There is a fringe of pine trees along the northern edge of the ridge, and a lone pine tree stands on the summit, to which angles are reduced.

[Latitude, 46° 56′ 30″.80. Longitude, 120° 40′ 46″.71.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Manastash (1)	243 41 37	63 42 21	3.15111
Reeser	193 40 47	13 44 50	4.47057

TANEUM, IN KITTITAS COUNTY.

On a bench or spur just north of Taneum Creek, about 12 miles by road (west of Yakima River) from Ellensburg, and one-half mile west of main road where it leaves the creek and turns northward. The view is cut off to the west.

Station mark: A stone 3 feet long, dressed, 6 inches square on top, and set 30 inches in the ground. The upper surface is marked U. S. G. S.

[Latitude, 47° 05′ 27″.08. Longitude, 120° 45′ 34″.73.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stuart	166 03 50.89	345 57 40.32	4.6420078
Reeser	227 00 54.15	47 08 28.68	4.2514162
Manastash (1)	335 11 58.90	155 16 13.52	4.2442073

MOUNT STUART, IN KITTITAS COUNTY.

A high, sharp peak, 38 miles air line and about 50 miles by road and trail north-northwest of Ellensburg. It can best be reached from the southeast by following up the Teanaway River to near its head, then crossing over a divide to a branch of Engle Creek, following a good trail nearly all the way to the foot of Mount Stuart range. The peak can be ascended only by following a main ridge on the southeast side, crossing westward when about halfway up, into a gulch leading toward the main summit. The station is located on the central and highest ledge of the summit.

[Latitude, 47° 28′ 25″.03. Longitude, 120° 53′ 59″.10.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Aix	19 39 41.66	199 24 08.70	4.9043548
Rainier	43 33 45.40	222 56 00.00	4.9776010
Chimney	97 04 57.70	276 47 47.00	4.4686840

MOUNT AIX, IN YAKIMA COUNTY.

A high, sharp, symmetrical summit at the head of Rattlesnake Creek, in Yakima County. It is not locally known by this name, but by some is called Nelson Butte. It can be reached from the east by taking the trail to the "Forks" of the Rattlesnake, then following the divide between the forks until the main leading ridge is reached.

Station mark: Hole drilled in rock, above which is a rock cairn 4 feet across the base and 5 feet high.

[Latitude, 46° 47′ 36″.39. Longitude, 121° 15′ 11″.91.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Rainier	99 40 10.8	279 18 06.0	4.5915500
Chimney	178 08 36.6	358 07 06.7	4.8988450

CHIMNEY ROCKS (not occupied).

[Latitude, 47° 30′ 20″.34. Longitude, 121° 17′ 14″.45.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stuart	276 47 47.0	97 04 57.7	4.468684
Reeser	302 27 00.4	122 57 53.7	4.798290

MOUNT ADAMS (not occupied).

[Latitude, 46° 12′ 04″.9. Longitude, 121° 29′ 16″.9.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Aix	195 13 18.4	15 23 31.0	4.83395
Reeser	211 29 15.4	32 08 35.4	5.11618

MOUNT RAINIER (not occupied).

[Latitude, 46° 51′ 04″.84. Longitude, 121° 45′ 28″.50.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stuart	222 56 00.0	43 33 45.4	4.977601
Reeser	246 01 38.0	66 53 01.0	4.987050

SPOKANE ASTRONOMIC STATION.

The pier for this station is located in the grounds of the new county court-house, near the southeast corner of the lot, 67.4 feet east of the United States Coast and Geodetic Survey longitude pier of 1888, 128 feet east and 30 feet south of cupola on the new court-house.

The computed position of this pier is latitude 47° 39′ 51″.46; probable error, ±″.13; longitude, from observations by United States Coast and Geodetic Survey in 1888, 117° 25′ 46″.20.

SPOKANE BASE LINE.

This base line was measured along a tangent of the Northern Pacific Railway, beginning about 2½ miles east of Spokane depot and extending eastward 5 miles. The terminal points were transferred to the embankment 25 feet north of north rail.

West base is opposite station 4369.08 of railroad alignment; east base is opposite station 4105.08 of railroad alignment. Two measurements were made, at night, and they differed by 0.066 feet.

The adopted length of the Spokane base, in feet, corrections being made for slope, temperature, and reduction to sea level, is 26,404.641.

SPOKANE, EAST BASE.

Station mark: A dressed stone 7 by 7 by 36 inches, set 30 inches in ground, 25 feet north of north rail and 94 feet eastward from sign marked "Trent 1 mile." The stone is marked on top $\overset{\text{U. S.}}{\underset{\text{E. Base.}}{+}}$

[Latitude, 47° 41′ 01″.94. Longitude, 117° 15′ 58″.70.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Moran	14 37 16.02	194 35 48.17	3.9929426
West base	73 23 19.07	253 18 45.80	3.9056962
Court-house cupola	80 02 46.43	259 55 31.41	4.0956581
Little Baldy	117 19 24.54	297 16 30.04	3.7432302
Mica Peak	288 10 38.61	108 22 55.95	4.3409600

MORAN, IN SPOKANE COUNTY.

On the northern end of a high, wooded ridge about 8 miles southeast of Spokane, in a cleared field about 50 feet west of the ruins of a log cabin. A wagon road runs to the station.

Station mark: A dressed stone, 8 by 8 by 36 inches, marked U.△S., set 30 inches in the ground.

[Latitude, 47° 35′ 53″.67. Longitude, 117° 17′ 57″.59.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Court-house cupola	126 55 28.15	306 49 41.22	4.0882682
Tomkinson	140 29 39.00	320 22 39.05	4.2697837
Little Baldy	168 33 40.57	348 32 14.04	4.0900766
Mica Peak	263 25 05.73	83 38 50.36	4.3704936

LITTLE BALDY, IN SPOKANE COUNTY.

On a small, flat hill 5 miles northeast of Spokane and in the center of a cleared field on the highest part of the hill. A fringe of tall pine trees extends around the hill.

Station mark: A dressed stone, 8 by 8 by 36 inches, marked U.△S., set 30 inches in the ground.

[Latitude, 47° 42′ 24″.16. Longitude, 117° 19′ 54″.63.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Court-house cupola	57 24 18.29	237 19 57.66	3.9409362
Tomkinson	103 43 22.18	283 37 48.45	3.9857308
Mount Carlton	214 13 32.20	34 23 09.80	4.4590100
Mica Peak	289 58 08.50	110 13 20.40	4.4378494
East base	297 16 30.04	117 19 24.54	3.7432302

SPOKANE, WEST BASE.

Station mark: A dressed stone, 7 by 7 by 36 inches, set 30 inches in the ground, 25 feet north of rail and 218 feet eastward from sign board "R. R. X'ng ½ mile." The top of the stone is marked $\overset{\text{U. S.}}{\underset{\text{W. Base.}}{+}}$

[Latitude, 47° 39′ 47″.28. Longitude, 117° 22 08″.34.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Court-house cupola	91 45 38.07	271 42 56.36	3.6595819
Tomkinson	137 10 30.83	317 06 36.14	3.9881446
Little Baldy	209 54 21.35	29 56 00.21	3.7474231
East base	253 18 45.80	73 23 19.07	3.9056962
Mica Peak	278 57 36.00	99 14 26.34	4.4609400
Moran	324 00 35.75	144 03 41.01	3.9500715

COURT-HOUSE CUPOLA, SPOKANE (not occupied).

This point is connected by direct measurement with longitude pier of the United States Coast and Geodetic Survey of 1888 and with latitude pier of the United States Geological Survey, 1896. It is also connected with the stations of the base expansion by triangulation. The point located is the center of the flagstaff, which is over the center of the cupola of the new court-house.

[Latitude, 47° 39′ 51.76″. Longitude, 117° 25′ 47.10″.]

TOMKINSON, IN SPOKANE COUNTY.

On the southern part of a small table-land 4 miles north of Spokane, on the highest knoll in pasture of Mr. Tomkinson, and one-eighth of a mile southwest of his house.

Station mark: A dressed stone, 8 by 8 by 36 inches, marked U.△S., set 30 inches in the ground.

[Latitude, 47° 43′ 38″.24. Longitude, 117° 27′ 25″.74.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Carlton	229 52 14.20	50 07 26.20	4.5239630
Court-house cupola	343 36 09.45	163 37 22.41	3.8627730

OREGON.

The triangulation in southwestern Oregon extends from Eugene to the California State line. It rests upon the astronomic position of the observatory of the State University at Eugene, determined during the season of 1894 by Mr. S. S. Gannett in cooperation with Prof. George Davidson, assistant, United States Coast and Geodetic Survey, and upon a base line 7 miles in length measured by Mr. W. T. Griswold on a tangent of the Oregon and California Railroad near Eugene.

The field work of the triangulation was carried on by Mr. Griswold during the seasons of 1895 and 1896.

The average closure error of all triangles in this scheme is 7″.0.

EUGENE BASE LINE.

This base was measured along the tangent of the Oregon and California Railroad, passing through the town of Irving. The adopted length, after correcting for inclination, temperature, and elevation above sea, is 38,425.3 feet.

CASTLE ROCK, IN LANE COUNTY.

A rocky knob on the top of Bear Mountain at the head of Bear Creek, in Lane County. It can be reached by trail on ridge to the east of Bear Creek to top of mountain, thence west to a small burnt saddle, thence south across head of small stream to highest butte of mountain.

Station-mark: Bull-pine tree.

[Latitude, 43° 50′ 34″.18. Longitude, 122° 53′ 26″.58.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Harness	26 08 35.22	205 59 37.34	4.5987349
Yellow Creek	51 34 00.43	231 12 47.91	4.7226620
Wards	61 00 54.95	240 49 52.61	4.3889250

SEAVIES, IN LANE COUNTY.

The southernmost knob of the range of mountains between the Mohawk River and the Willamette Valley in Lane County, nearly due east of the town of Coburg.

Station mark: Square-cut stone, 4 by 4 inches by 2 feet, set in the ground.

[Latitude, 44° 06′ 29″.77. Longitude, 122° 59′ 54″.12.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Observatory	52 58 37.53	232 54 45.54	3.9683231
Spencer	29 02 13.39	208 58 12.47	4.2017003
South base	75 38 34.81	255 32 23.75	4.0879122
Castle Rock	343 38 18.23	163 42 47.32	4.4875925

OBSERVATORY AT EUGENE.

In the city of Eugene, Lane County, at the eastern end of Skinners Butte, 230 feet above and one-fourth mile north of the railroad station.

Station mark: Transit pier in the observatory of the State University.

[Latitude, 44° 03′ 28″.27 ± .09″. Longitude, 123° 05′ 27″.81 ± .34″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Spencer	2 00 21.00	182 00 11.92	3.9200613
Seavies	232 54 45.54	52 58 37.53	3.9683231

SPENCER, IN LANE COUNTY.

A sharp butte 1,800 feet high, 6 miles south of the city of Eugene. A road from Eugene passes over the southwest side of the butte.

Station mark: A forked umbrella tree; station taken as the middle point between the two trunks, which stand about 6 inches apart.

[Latitude, 43° 58′ 58″.905. Longitude, 123° 05′ 40″.645.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Observatory	182 00 11.92	2 00 21.00	3.9200613
Harness	1 07 22.94	181 06 52.01	4.7096436
Wards	10 17 51.84	190 15 17.28	4.4459991
Yellow Creek	27 10 11.10	206 57 24.38	4.7363542
Roman Nose	81 31 18.49	261 04 32.61	4.7176852
Castle Rock	313 29 33.54	133 38 02.35	4.3541801

HARNESS, ON LANE-DOUGLAS COUNTY LINE.

A small butte on the Calapoosa Mountains, at the head of Elk Creek. It is reached from Oakland, Oregon, by road up Oldham Creek to last house, thence by trail to Harnessburn Camp, which is within one-half mile of station.

Station mark: Large fir tree, blazed.

[Latitude, 43° 31′ 18″.83. Longitude, 123° 06′ 25″.36.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dodson	13 52 44.82	193 47 09.10	4.6638683
Wilbur	46 14 07.65	226 02 36.98	4.4961889
Yellow Creek	96 33 59.22	276 21 46.55	4.3808862

SOUTH BASE, IN LANE COUNTY.

At a point on the extension to the south of the tangent of the Oregon and California Railroad passing through Irving, 1,860 feet from the track; theodolite elevated 12 feet.

Station mark: Marble post 6 by 6 by 18 inches, sunk 1 foot under ground, and marked U. S. G. S.

[Latitude, 44° 04′ 51″.06. Longitude, 123° 08′ 47″.23.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
North base	159 27 53.01	339 25 44.23	4.0686330
Hamenway	79 28 45.97	259 25 57.98	3.7376744
Seavies	255 32 23.75	75 38 34.81	4.0879122

NORTH BASE, IN LANE COUNTY.

At a point where the extension to the north of the center line of the Oregon and California Railroad tangent through Irving will reach a distance of 12 feet to the west of the right of way of the railroad. The land at this point is almost level. The theodolite was elevated 12 feet.

Station mark: Cut marble monument 6 by 6 by 18 inches, marked U. S. ● G. S. sunk 1 foot under the ground.

[Latitude, 44° 10′ 46″.368. Longitude, 123° 11′ 52″.185.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Seavies	296 19 23.89	116 27 44.00	4.2508262
Hamenway	6 00 09.59	185 59 30.13	4.0803605
Spencer	339 13 43.87	159 18 02.31	4.3682483
South base	339 25 44.23	159 27 53.01	4.0686330

HAMENWAY, IN LANE COUNTY.

On a small cultivated hill to the south of the Eugene and Siuslaw road, about 6 miles from Eugene, being part of the farm of Valney Hamenway.

Station mark: Square cut stone 4 by 4 inches, with small hole in middle, buried under the ground.

[Latitude, 44° 04′ 18″.65. Longitude, 123° 12′ 48″.74.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Spencer	315 57 00.12	136 01 57.68	4.1373938
Seavies	256 42 32.17	76 51 31.15	4.2479930

GREEN MOUNTAIN, IN JACKSON COUNTY.

Not on Green Mountain, as indicated by name, but on the southern end of Onion Spring Mountain. The station can be reached from the north by leaving Oregon and California stage road near the house of John Gallam, taking road up Quine Creek to O. Gilpatrick's, thence by trail to top of Onion Spring Mountain, thence south and west on trail about 2 miles to station.

Station mark: Nail in hole drilled in rock.

[Latitude 42° 41′ 29″.57. Longitude 123° 13′ 46″.53.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Silver Ridge	147 01 14.58	326 55 12.08	4.3463634
Boliver	102 50 11.03	282 25 31.31	4.7060450

DODSON, IN DOUGLAS COUNTY.

A high, cleared butte 7 miles south of Roseburg.

Station mark: Copper bolt set in solid rock, above which is a pile of rocks 6 feet high.

[Latitude, 43° 07′ 07″.756. Longitude, 123° 14′ 34″.71.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Silver Ridge	20 51 31.86	200 46 01.79	4.4894941
Kenyon	73 29 32.15	253 07 38.78	4.6574727
Green Mountain	358 40 34.66	178 41 07.51	4.6764927

SILVER BUTTE, IN DOUGLAS COUNTY.

On the highest point of the mountain at the head of Middle, Mitchell, and Canyon creeks. It can be reached from Riddles by the wagon road up Cow Creek.

Station mark: Pine tree, trimmed up.

[Latitude, 42° 51′ 32″.746. Longitude, 123° 22′ 38″.82.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Kenyon	115 57 58.61	295 41 38.16	4.5595026
Dodson	200 46 01.79	20 51 31.89	4.4894941
Wilbur	179 13 16.12	359 12 54.76	4.7153149
Green Mountain	326 55 12.08	147 01 14.58	4.3463634

WILBUR, IN DOUGLAS COUNTY.

On highest bald hill 2 miles west from the town of Wilbur.

Station mark: Stake driven under ground, with large nail in center.

[Latitude, 43° 19′ 35″.006. Longitude, 123° 23′ 10″.136.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dodson	333 10 54.71	153 16 47.70	4.4120934
Silver Ridge	359 12 54.76	179 13 16.12	4.7153149
Kenyon	41 30 42.21	221 14 38.89	4.6823700

YELLOW CREEK, IN DOUGLAS COUNTY.

The highest point of mountains at head of Yellow Creek. It can be reached from the old Oakland and Yoncalla road by a trail which starts at house situated at the last forks of Cabin Creek, thence along divide of mountain about 6 miles. The trail passes over the north side of the butte that station is on.

Station mark: A large fir tree, blazed and marked with tacks "U. S. G. S."

[Latitude, 43° 32′ 46″.53. Longitude, 123° 24′ 09″.10.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dodson	344 42 08.11	164 48 42.26	4.6921315
Wilbur	356 53 14.95	176 53 55.49	4.3885002
Loon Lake	98 13 50.07	277 53 28.24	4.6039592
Roman Nose	146 31 44.14	326 17 50.81	4.6881820

KERBY, IN JOSEPHINE COUNTY.

High point on north end of ridge, 10 miles east of Kerbyville.

[Latitude, 42° 13′ 12″.20. Longitude, 123° 27′ 36″.62]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Preston	16 19 48.82	196 13 45.34	4.6488804
Chitco	76 54 30.83	256 35 07.64	4.6111640
Red Mountain	105 30 41.17	285 15 10.30	4.5172816

ROMAN NOSE, IN DOUGLAS COUNTY.

A high, bald mountain near the headwaters of Twin Sisters Creek, a branch of Smith River.

Station mark: Dead tree.

[Latitude, 43° 54′ 43″.03. Longitude, 123° 44′ 14″.60.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Loon Lake	19 58 55.88	199 52 23.66	4.5708465
Leaning Tree	30 32 02.10	210 22 01.62	4.5840630
Spencer	261 04 32.61	81 31 18.49	4.7176852
Yellow Creek	326 17 50.81	146 31 44.14	4.6881820

KENYON, ON COOS-DOUGLAS COUNTY LINE.

On the southernmost point of mountain range to west of Camas Valley. It is reached by a trail from southwest corner of Camas Valley.

Station mark: Fir tree with copper bolt in root on northeast side.

[Latitude, 43° 00′ 04″.82. Longitude, 123° 46′ 38″.31.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Silver Ridge	295 41 38.16	115 57 58.61	4.5595027
Green Mountain	307 21 36.00	127 43 56.90	4.7518290
Boliver	11 29 38.98	191 27 17.08	4.3761416
Pilot Knob	64 10 16.24	243 51 37.41	4.6175850
Watches	83 27 40.44	263 07 23.95	4.6096996

BOLIVER, IN CURRY COUNTY.

A high bald mountain at head of Mule Creek, Coquille River, and west fork of Cow Creek. It can be reached from railroad by Antone trail at Rifle Creek (Tunnel No. 3, Oregon and California Railroad) to Cold Spring, thence following main ridge to station; distance about 6 miles. It can also be reached from Camas Valley by trail to Garden of Eden, thence to head waters of Cow Creek, thence up point of mountain.

Station mark: Copper bolt, above which is a pile of rocks.

[Latitude, 42° 47′ 29″.72. Longitude, 123° 50′ 06″.78.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bear Camp	9 31 17.67	189 29 30.03	4.3400109
Green Mountain	282 25 31.31	102 50 11.03	4.7060450

RED MOUNTAIN, IN JOSEPHINE COUNTY.

A mountain on west side of Illinois River, about 20 miles northwest from Kerbyville.

[Latitude, 42° 17′ 55″.10. Longitude, 123° 50′ 40″.84.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Eltmore	72 27 29.03	252 12 10.36	4.5167962
Bear Camp	175 06 11.20	355 04 47.05	4.5224757
Green Mountain	228 59 36.63	49 24 32.46	4.8247472

BEAR CAMP, IN CURRY COUNTY.

A high rocky point on main divide south of Rogue River, directly on trail from Grants Pass to Ellensburg (now called Gold Beach). Take trail to camping ground known as Bear Camp, thence 4 miles southwest to station. Station taken as highest point of rock.

[Latitude, 42° 35′ 50″.44. Longitude, 123° 52′ 45″.51.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Boliver	189 29 30.02	9 31 17.67	4.3400109
Green Mountain	258 40 09.51	79 06 33.69	4.7348211

LOON LAKE, IN COOS COUNTY.

A flat knob, being the highest point on the divide to the west of Loon Lake. It can be reached from Scottsburg by a trail to Loon Lake, thence on Gould trail to divide of mountain, thence north on divide to point where highest knob lies directly across canyon to left, thence across the canyon.

Station mark: A fir tree, trimmed up for 20 feet.

[Latitude, 43° 35′ 49″.08. Longitude, 123° 53′ 41″.76.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Elk Peak	10 20 09.73	190 19 34.33	3.8080096
Leaning Tree	105 47 33.44	285 44 05.93	3.8479060
Yellow Creek	277 53 28.24	98 13 50.07	4.6039592

CHITCO, IN JOSEPHINE COUNTY.

Situated on the most northerly of three peaks of a mountain at the head of the southerly fork of the Chitco River and a northerly branch of the north fork of Smith River, about 18 miles west of Kerbyville, Josephine County.

[Latitude, 42° 08′ 08″.70. Longitude, 123° 56′ 29″.01.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Red Mountain	203 47 00.81	23 50 54.77	4.2961634
Kerby	256 35 07.64	76 54 30.83	4.6111640
Preston	320 32 45.10	140 46 00.80	4.6353986

ELTMORE, IN CURRY COUNTY.

A mountain, locally known as Bosley Butte, at the head of the south fork of the Pistol River and west of the Chitco River.

[Latitude, 42° 12′ 31″.76. Longitude, 124° 13′ 27″.09.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Whiskey	167 52 30.72	347 50 05.08	4.3720118
Bear Camp	213 13 30.46	33 27 27.70	4.7131513
Red Mountain	252 12 10.36	72 27 29.03	4.5167962
Chitco	289 03 30.42	109 14 53.92	4.3933465

PILOT KNOB, IN CURRY COUNTY.

A very sharp, rocky butte, around which circle the head waters of Sixes River. It is reached by trail from Eckley post-office, the old Eckley-Port Orford trail passing around the north side of the butte.

Station mark: Copper bolt set in rock under tripod signal.

[Latitude, 42° 50′ 16″.23. Longitude, 124° 14′ 01″.375.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sugar Loaf	206 57 04.62	27 03 28.52	4.4491598
Boliver	278 49 24.35	99 05 39.34	4.5184456

WATCHES, ON COOS–CURRY COUNTY LINE.

The westernmost of two knobs from which timber has been burned off at the head of Flores and Catching Creek. Reached by wagon road from Myrtle Point or Port Orford, which passes directly around the two knobs.

Station mark: Copper bolt set in loose sand rock under tripod signal.

[Latitude, 42° 57′ 30″.73. Longitude, 124° 16′ 22″.71.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bald Mountain	10 15 47.39	190 12 48.17	4.5277727
West Port	183 47 15.49	3 48 33.67	4.5942672
Sugar Loaf	233 47 46.00	53 55 46.75	4.2958552
Boliver	297 15 27.15	117 33 19.41	4.6052025
Bear Camp	321 06 16.62	141 22 19.12	4.7114385
Pilot Knob	346 32 09.26	166 33 45.46	4.1394338

BALD MOUNTAIN, IN CURRY COUNTY.

One and a half miles southeast of mountain locally known as Bald Mountain. The point is locally called Rocky Peak. It can be reached by road up the coast to Dave Cary's ranch on Mussel Creek, thence by trail east 6 miles to the summit of the mountain.

Station mark: Copper bolt and pile of rocks.

[Latitude, 42° 39′ 35″.65. Longitude, 124° 20′ 46″.42.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bear Camp	280 07 30.83	100 26 29.20	4.5902585

SECONDARY POSITIONS.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Wards	43 44 08.6	123 09 23.7
Smith River	43 45 09.0	123 27 08.4
Silver Ridge	42 47 12.2	123 28 09.1
Dutchmans Butte	42 52 00.1	123 39 32.3
Elk Peak	43 32 24.2	123 54 33.1
Leaning Tree	43 36 51.1	123 58 44.1
Cathcart	43 21 03.5	123 58 53.5
Trail Butte	43 30 04.8	124 02 11.1
Sugar Loaf	43 03 48.4	124 04 37.9
Noah	43 23 24.6	124 07 48.0
Marshfield Hill	43 22 23.2	124 12 50.1
West Port	43 18 41.1	124 14 27.6
Mount Butler	42 46 01.6	124 15 32.7
Whiskey	42 24 58.0	124 17 03.4

CALIFORNIA.

PRESTON, IN DEL NORTE COUNTY.

High peak on Siskivou Range at head of Preston Creek, Del Norte County, California.

[Latitude, 41° 50′ 06″.06. Longitude, 123° 36′ 39″.53.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Chitco	140 46 00.80	320 32 45.10	4.6353986
Red Mountain	159 29 29.62	339 20 05.94	4.7404287
Kerby	196 13 45.34	16 19 48.82	4.6488804

SPIRIT LEVELING.

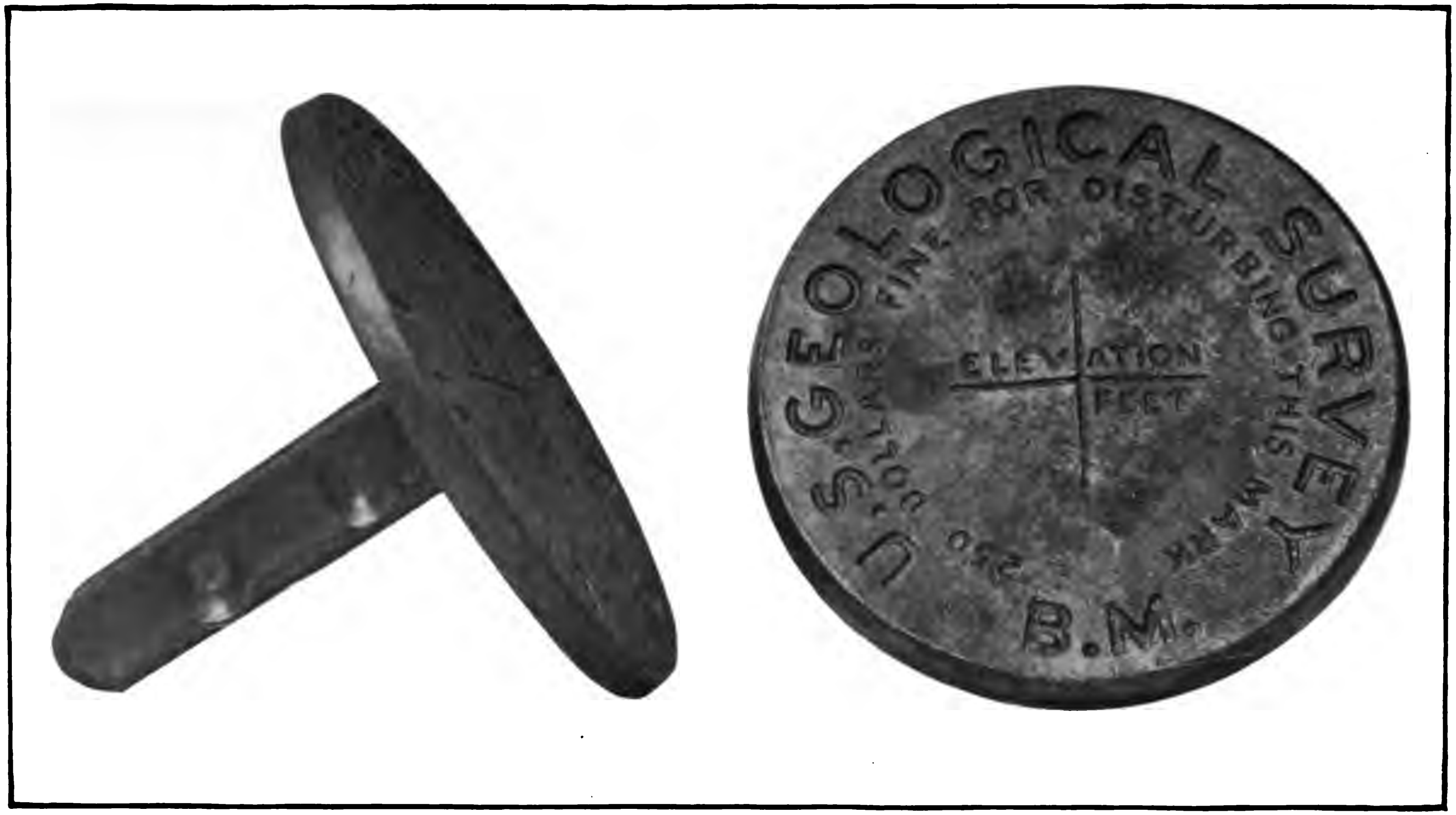
During the season of 1896 the field parties engaged in the topographic mapping conducted careful spirit leveling on a scale more extended and of a quality more accurate than had ever before been attempted. This was in pursuance of the act of Congress providing for the sundry civil expenses of the Government for the fiscal year 1896–97, a paragraph of which is as follows:

> For topographic surveys in various portions of the United States, * * * * *Provided*, That hereafter in such surveys west of the ninety-fifth meridian, elevations above a base level located in each area under survey shall be determined and marked on the ground by iron or stone posts or permanent bench marks, at least two such posts or bench marks to be established in each township or equivalent area, except in the forest-clad and mountain areas, where at least one shall be established, and these shall be placed, whenever practicable, near the township corners of the public-land surveys; and in the areas east of the ninety-fifth meridian at least one such post or bench mark shall be similarly established in each area equivalent to the area of a township of the public-land surveys.

In the beginning it was realized by the framers of the above act that it would be impossible to establish accurately and mark correctly on the monuments their exact height above sea level. Any attempt to do this would have necessitated the running of thousands of miles of precise levels in order to connect with sea level the initial points within the various areas under topographic survey, and this would have cost immense sums and occupied several years, during which the topographic surveys would have continued without being accompanied by spirit leveling and the establishment of the bench marks required. The act was therefore so framed as to permit of the acceptance of some point within each area under topographic survey as a central datum point for that area, and the elevation of the initial bench mark established there was determined as nearly as practicable from existing elevations adjusted through by railway levels brought from the sea. In consequence, though all the elevations connected with the same central datum point will agree one with the other, yet they will not be reduced to exact sea level because of the differences between the primary elevations upon which leveling in the various localities is based. It is anticipated that the spirit-level work will be extended in the future until it ultimately connects with sea level, and the elevations determined can be corrected from time to time in publications, so that as each central datum point is reduced to sea level all the levels resting thereon may be adjusted thereto. It is worthy of note, however, that nearly half the work of the past season, diversified though it was, is based on existing careful levels—in New York, those of the State canals and United States Engineer Corps; in some portions of the South and West, those of the United States Engineer Corps; in much of the Central United States, those of the United States Coast and Geodetic Survey and the Missouri and Mississippi River Commission surveys.

It was decided that in addition to determining the elevations of these bench marks they should be instrumentally connected with the horizontal measurements taken in the course of topographic surveys, but only with such accuracy as would permit of their being properly plotted on the resulting maps, the location and elevation of these bench marks being published in two ways: First, by appropriate symbol on the atlas sheets—the letters B. M., and the elevation to the nearest foot; second, by lists of bench marks in the Annual Reports of the Survey, with a full description of each bench mark and its exact elevation above sea level to the thousandth of a foot, as referred to the various central datum points, these lists to be corrected in publications from time to time as connections are made with sea level. Herewith the first of such lists is published.

It was thought that these bench marks should be of the most attractive and substantial character consistent with reasonable cost, and after an examination of the various forms used by other Government and city surveys, three standard styles were selected. First, a circular bronze tablet, 3½ inches in diameter and one-fourth inch thick, appropriately lettered, having a 3-inch stem to be cemented into a drill hole in the vertical walls of public buildings, bridge abutments, or other substantial masonry structures (Pl. III), this to be used for the central datum points and in such places as call for an attractive bench mark. The second form consists of a copper bolt (fig. 1) 4 inches long and 1 inch in diameter, fastened into other masonry structures or solid rock by driving it on a brass wedge placed in the bottom of a vertical drill hole, so that the surface of the bolt is horizontal and forms the zero of the bench mark. The third form (Pl. IV), to be employed where masonry or rock is not accessible, consists of hollow wrought-iron posts, 4 feet 6 inches in length and 3½ inches in outer diameter,



BRONZE TABLET FOR BENCH MARK; OLD FORM.

split at the bottom and expanded to 12 inches, so as to prevent both the easy subsidence of the post and its being maliciously pulled out of ground. The iron is heavily coated with hot asphalt, and over the top of the post is riveted a bronze tablet similar to that first described. These posts are set in the earth with only 1 foot of their length projecting above the surface, and wherever possible a flat stone is placed in the bottom of the hole as a suitable rest.

In order that these bench marks should be so marked as to fulfill the apparent intention of Congress and supply the popular demand by showing approximate elevation above sea level, it was decided that they should not be given ordinary serial numbers, but that the approximate elevation to the nearest foot should be stamped upon them, and that these figures should constitute their numbering. It was soon found, however, that the assumed elevation above sea level as determined for a given point might be changed during a season or within a few seasons, and that this might change by several feet the relative elevations stamped on two bench marks adjacent one to the other. To satisfy both conditions, therefore—the popular demand for sea-level heights and the scientific demand for exact differences between adjacent bench marks—the following method has been adopted:

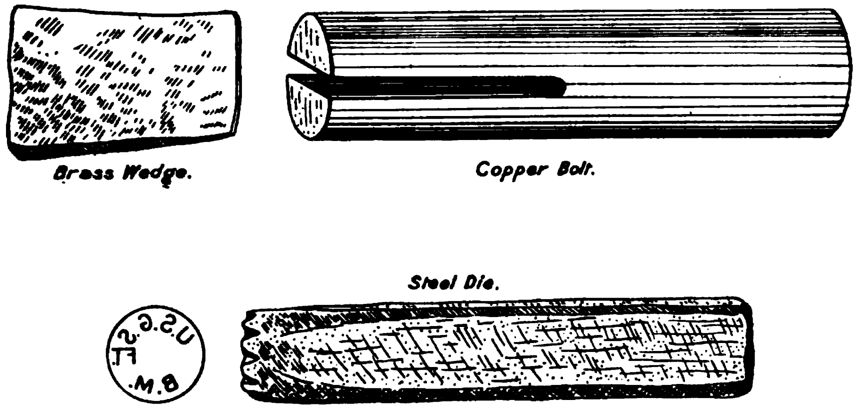


Fig. 1.—Copper bolt, brass wedge, and steel die for bench mark in rock or masonry.

The elevations above mean sea level to the nearest foot, as determined at the time of running levels, is stamped upon the bench mark, and, in addition, an abbreviation of the name of the central datum point. Thus, for an elevation depending on North Creek, the mark would be, say, "1728 N. C." on the copper bolt or on the iron posts and bronze tablets as in Pl. IV. As this datum has been found to be in error about 5 feet, future bench marks established in that neighborhood will be stamped as though resting upon a different datum, that of Fonda, from which the check was obtained, and the next bench mark to that above cited may be stamped "1810 Fonda." An engineer running between these two and finding them out according to his levels by 5 feet, would at once realize that the letters "N. C." or the name "Fonda" carried some special meaning, and would doubtless at once write to the office of the Geological Survey to inquire what it was.

After a study of instruments and methods it was decided that the work should be by first-class spirit-leveling methods, but not of such quality as would classify it as precise or geodetic leveling. In order to check and eliminate the errors incident to such work, it was decided that all lines of levels run within an area under topographic survey should be so arranged as to close back on themselves in circuits or polygonal figures, these lines to be run by a single levelman and rodman; the closure of various circuits, then, would at once lead to the detection of any gross errors. Unusually long or important lines are run by a levelman and two rodmen in such manner as to make a duplicate rodded line.

In order to establish as nearly a uniform grade of accuracy for the work as practicable, the following general instructions were issued:

INSTRUCTIONS FOR LEVELING.

1. Primary level lines should be run with one or two rodmen and one levelman, and when necessary a bubble tender. Where such lines are run in circuits which will check back upon themselves or other lines, one rodman will suffice. Where long, unchecked lines are run two rodmen must be employed.

2. SINGLE-RODDED LINES.—Levelman and rodman must keep separate notes and compute differences of elevation immediately. As levelman and rodman pass, the former must read the rod himself, record and compare readings, then compute the H. I., and after computations are made compare results with the rodman. No comparisons should be made until the record is complete. If the results differ, each must read the rod before comparing anything but results.

3. Work on primary lines should not be carried on during high winds or when the air is "boiling" badly. During very hot weather an effort should be made to get to work early and remain out late, rather than to work during midday.

4. Fore and back sights should be of equal length, and no sight over 300 feet should be taken excepting under unavoidable circumstances, as in crossing rivers at fords or ferries or in crossing ravines. In such cases extraordinary precautions must be taken, as repeated readings at changed positions of rod and level, etc.

5. If it is impracticable to take equal fore and back sights, as soon as the steep slope is passed take enough unequal sights to make each set balance. In this case extra care must be taken to insure correct adjustment of the level.

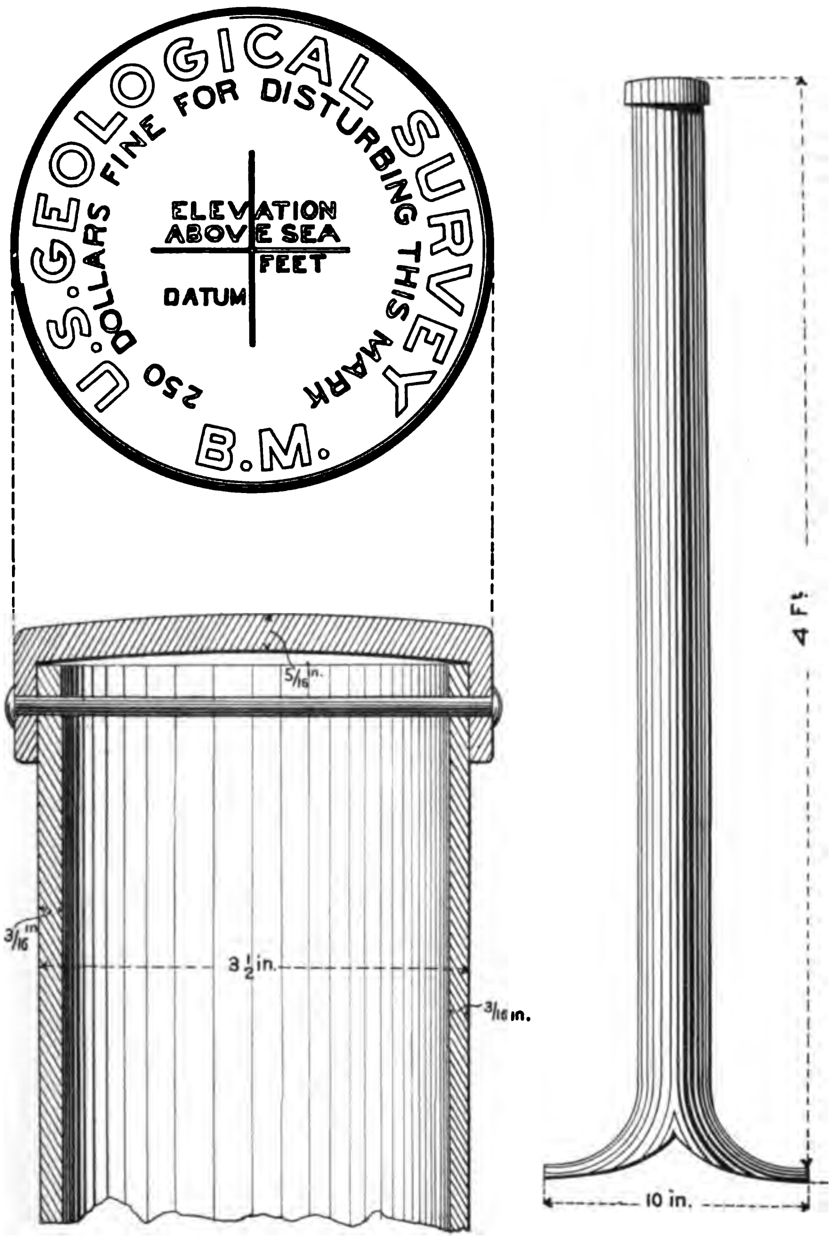
6. Distances along a railroad can be obtained by counting rails; at other times stadia or pacing may be used, according to the quality of the work. The distances in feet of both the fore and back sights must be recorded in both notebooks in the proper columns.

7. Always level the instrument exactly before setting the target. After setting it, and before giving the signal "all right," examine the level bubble. If found to be away from center, correct it and reset target.

8. The level must be adjusted daily, or oftener if necessary. The adjustment of the line of collimation and of the level tube is especially important.

9. Provide rodmen with conical steel pegs, 6 to 12 inches long, with round heads, to be used as turning points. Never take turning points on rails, ties, or between them. Always drive the pegs firmly into the ground.

10. When the rod is lengthened beyond 6.5 feet, both the rodman and the level man must examine the setting of the target as well as the the reading of the rod



BRONZE TABLET AND WROUGHT-IRON POST FOR BENCH MARK IN EARTH; NEW FORM.

vernier. When the rod is closed, see that the rod vernier indicates 6.5 feet, not depending upon the abutting end to bring it back to place. Keep the lower end of the rod and the top of the turning point free from mud and dirt.

11. Plumbing levels must always be used and kept in adjustment and long extensions of the rod avoided.

12. Leave temporary bench marks at frequent intervals, marked so that they can be easily identified. These may be on a solid rock, well marked, a nail driven in the root of a tree or post, or on any place where the mark will not be disturbed for a few weeks. One such bench mark should be left for every mile run, in order to give sufficient points to which to tie future levels. Mark in large figures, in a conspicuous place when possible, the elevation to the nearest foot. Make notes opposite all elevations at crossings of roads, railroads, streams, bridges, and in front of railway stations and public buildings, and of such other facts as may aid the topographer in his work.

13. All permanent bench marks must be on copper bolts or bronze tablets let in drill holes in masonry structures or in solid rock, or be on the iron posts adopted by this Survey. The figures of elevation must be stamped well into the metal to the nearest foot only, also name or initial letter of the central datum point.

14. A complete description, accompanied by a large-scale sketch, must be made of each bench mark, giving its exact elevation as computed from the mean of the two sets of notes. After bench marks are stamped, both level man and rodman must examine them and record in notebooks the figures stamped thereon.

15. The limit of error in feet should not exceed $.05\sqrt{\text{distance in miles}}$.

16. Use the regular Survey level books; keep full descriptive notes on title-page of every book, giving names, dates, etc. Each man should be responsible for his own notebook, and under no circumstances should erasures be made, a single pencil line being drawn through erroneous records.

17. When errors are discovered as the work progresses, report the same at once to the topographer in charge.

18. Keep each set of notes separately and independently as taken, paying no attention whatever to other notes except to compare results. If on comparison errors are discovered, correct them only by new observations or computations. All notes must be recorded directly in notebook. Separate pieces of paper for figuring or temporary records must not under any circumstances be used.

19. In long, single-rodded lines make two target settings on each turning point by first signaling "up" or "down" to a setting, which is recorded by the rodman, then unclamping and signaling in the opposite direction to a setting. If the two differ more than .002 of a foot, additional readings must be made. The rodman should record all readings, using in his computations only the first of the pair adopted and the level man the last.

20. DOUBLE-RODDED LINES.—In running unchecked or single primary lines with two rodmen, they should set on turning points 10 to 20 feet apart, but each at equal distances for fore and back sights; otherwise the above instructions are to be followed with the following modifications:

21. The tripod clamping screws should be loosened when the instrument is set, and tightened only after the legs are firmly planted, and the instrument must be shaded at all times by the bubble tender.

22. The laborer should place the steel turning points for foresights and then return and not remove the back-sight points until the level man has set targets on the new foresight, so that there shall be in the ground at all times two turning points, the elevations of which are known.

23. Bench marks left at termination of work at night, or for rain or other cause, should be practically turning points in a continuous line. They should consist of large wooden pegs, driven below the surface of the ground, with a copper nail firmly embedded in the top. One of these pegs is to be used as the final turning point for

each rodman. They are to be covered with dirt or otherwise hidden, their location being marked by sketches in notebooks showing relation to railroad ties, telegraph poles, etc.

24. An index book or list of bench marks must be kept posted in the field, in ink, for all classes of leveling done. In these, location sketches of permanent bench marks may be made, and descriptions should in every case refer, with distance, to some village, section corner, or other place of local importance. All circuit-closure errors should be distinctly noted, with cross reference, by page, to the connecting lines.

After careful investigation of the various instruments suited to this work, it was decided that the 20-inch engineer's level made by Messrs. Gurley & Co., of Troy, New York, would fill the requirements, and that the New York rod, made by the same firm, and furnished with plumbing levels and with a specially constructed foot plate, would be the most suitable rod. It is believed that the results obtained fully justify the wisdom of the selection. The only change made in the rods from those regularly furnished was in making the foot plate a truncated pyramid of brass, the bottom of which was but one-half inch in width. This was in order to keep it freer of dirt and to compel its being placed more accurately on the top of the steel turning peg. The only change from the regular form made in the instrument was in increasing the sensitiveness of the level bubble by using bubbles graduated to 10 seconds of arc.

LOCALITIES OF WORK, ETC.

As an indication of the accuracy obtained, the following table is given, which shows the distribution of the leveling parties, localities of work, and lengths of all closed circuits in miles, with their closure errors in feet:

Localities of work, lengths of closed circuits, closure errors, and levelmen.

State.	Locality.	Length of circuit.	Closure error.	Levelman.
		Miles.	*Feet.*	
New York........	Adirondacks	57	0.021	Clark Brown.
Do	.....do	90	0.041	Do.
Do	.....do	53	0.125	Do.
Do	.....do	78	0.145	Do.
Do	.....do	57	0.166	Do.
Do	.....do	80	0.020	Do.
Do	.....do	69	0.016	A. F. Krause.
Do	.....do	85	0.020	Do.
Do	.....do	48	0.039	Do.
Do	Utica	35	0.042	A. B. Pomme.
Do	.....do	23	0.050	Do.

Localities of work, length of closed circuits, closure errors, and levelmen—Continued.

States.	Locality.	Length of circuit.	Closure error.	Levelman.
		Miles.	*Feet.*	
New York	Auburn	30	0.232	A. B. Pomme and E. L. McNair.
Do	do	35	0.911	Do.
Do	do	29	0.027	Do.
Do	Skaneateles	45	0.395	A. B. Pomme.
Do	do	44	0.110	Do.
Do	Moravia	35	0.607	Do.
Do	do	45	0.683	Do.
Do	Lockport	13	0.198	E. L. McNair.
Do	do	17.5	0.051	Do.
Do	Medina	4.5	0.610	Do.
Do	do	7.5	0.371	Do.
Do	do	8.5	0.241	Do.
Do	Oak Orchard	5.5	0.040	Do.
Do	do	5.5	0.009	Do.
Do	do	4	0.128	Do.
Do	Olean	38	0.168	Do.
Do	do	5.5	0.019	Do.
Maryland	Elkton	26	0.007	O. L. Pettibone.
Do	do	28	0.110	Do.
Do	do	13	0.013	Do.
Do	do	15	0.097	Do.
Delaware	Dover	112	0.284	O. L. Pettibone and C. Goldsborough.
Do	do	94	0.216	C. Goldsborough.
Do	do	89	0.390	Do.
Do	do	57	0.178	Do.
Do	do	55	0.129	Do.
Do	do	37	0.037	Do.
Do	do	36	0.335	Do.
West Virginia	St. Albans	30	0.058	H. Wood.
Do	Logan	87	1.168	Do.
North Carolina	Asheville	41	0.103	E. L. Faison.
Do	Brevard	52	0.014	Do.
Do	do	29	0.017	Do.
Georgia	Ellijay	3	0.032	T. S. Mauldin, jr.
Do	do	33	0.402	Do.
Do	do	33	0.033	Do.
Do	do	14	0.045	Do.
Do	do	32	....	Do.

Localities of work, length of closed circuits, closure errors, and levelmen—Continued.

State.	Locality.	Length of circuit.	Closure errors.	Levelman.
Georgia	Rome	37	0.048	J. A. McDonough.
Do	do	41	0.371	Do.
Do	Cave Spring	53	0.216	Do.
Alabama	Summerville Gaylesville	83	0.216	Do.
Do	Rock Run	30	0.043	Do.
Michigan	Champion	32.5	0.270	E. C. Bebb.
Do	do	6.5	0.420	Do.
Iowa	Dubuque	9.5	0.343	G. W. Newell.
Do	do	41.5	0.343	Do.
Do	do	9	0.280	Do.
Do	do	38	0.280	Do.
Do	do	56	0.470	Do.
Do	do	44	0.786	Do.
South Dakota	Yankton	116	0.608	Alfred Tyler.
Do	do	27	0.553	Do.
Do	do	22	0.631	Do.
Do	do	17	0.173	Do.
Do	do	32	0.044	Do.
Do	do	57	0.425	Do.
Do	do	26	0.831	Do.
Nebraska	Sidney	29.5	0.361	H. M. Trippe.
Do	do	30.5	0.182	Do.
Do	do	47	0.158	Do.
Do	do	42.5	0.018	Do.
Do	do	75.5	*0.260	Do.
Missouri	De Soto	45	0.248	A. F. Montmorency.
Do	do	44	0.824	Do.
Do	do	60.5	0.082	Do.
Do	do	62	0.589	Do.
Do	do	35	0.418	Do.
Do	do	18.5	0.048	Do.
Do	do	80.5	0.248	A. F. Montmorency and C. H. Dana.
Arkansas	Hot Springs	20.5	0.680	H. L. Muldrow.
Do	do	31	0.590	Do.
Do	do	21	0.370	Do.
Illinois	Havana	20	0.080	C. H. Dana.
Do	do	7	0.503	Do.

Localities of work, length of closed circuits, closure errors, and levelmen—Continued.

State.	Locality.	Length of circuit.	Closure errors.	Levelman.
Illinois	Havana	6	0.856	C. H. Dana.
Do	do	15	0.006	Do.
Montana	Boulder	23	0.062	F. B. Whitlock.
Do	do	18	0.015	Do.
Do	do	14	0.111	Do.
Do	do	17	0.079	Do.
Do	do	80	0.295	Do.
Do	Big Horn Basin	36	0.120	E. W. Glafcke.
Wyoming	do	92	0.362	Do.
Colorado	Durango	19	0.145	C. W. Beach.
Do	do	20	0.270	Do.
Do	Thatcher	48	0.071	J. C. Barber.
Do	Boone	95	0.208	Do.
Do	do	42	0.204	Do.
Texas	Uvalde	63	0.138	J. A. Hinman and W. W. Campbell.
Do	do	60	0.046	
Do	do	40	0.066	R. H. Gresham.
Do	do	41	0.018	
Do	do	35	0.035	
Do	do	51	0.103	W. W. Campbell.
Do	do	52	0.318	Do.
Do	Hondo	36	0.012	J. A. Hinman.
Do	Lockhart	136	0.190	Do.
Do	San Antonio	195	0.420	Do.
Do	Bastrop	166	0.289	Do.
Do	Austin	41	0.051	Do.
Do	Sabinal	83	0.265	Do.
Idaho	Red Fish Lake	70	0.240	A. B. Searle.
Washington	Mount Stuart	70	0.150	F. L. Cole.
Oregon	Portland	42	0.100	C. C. Ward.
Do	do	25	0.072	Do.
Do	Coos Bay	62	1.049	Do.
Do	do	38	1.391	Do.
Do	do	95	0.342	Do.
California	Stockton	170	*0.100	J. B. Lippincott.
Do	Mount Diablo	72	0.183	J. A. Vogelson and G. H. Herrold.
Do	do	57	0.235	G. H. Herrold.
Do	Karquines	33	0.120	J. A. Vogelson.

*The lines marked with an asterisk were double rodded, and the errors given represent the divergence between the two rods.

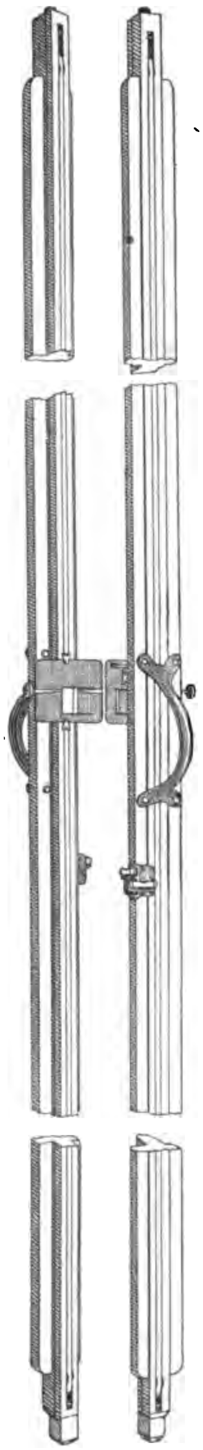


FIG. 2.—Precise level rod; two views.

The State of North Carolina, in cooperation with certain of the railways of that State, decided during the fall to have a line of precise levels run from the sea at Morehead City via Asheville to the Tennessee State line at Paint Rock, a distance of 457 miles, in such manner as to cross every line of railway in the State, and thus reduce its elevations to sea level. A study of the results obtained by the United States Geological Survey induced the North Carolina officials to ask this Bureau to suggest the methods and instruments to be employed in this work and to supervise its prosecution. After a thorough investigation of the various methods employed throughout the world in levels of precision, an improved spirit level was selected and spirit-level methods were adopted, in preference to geodetic methods.

For the reduction of these levels to mean sea level there was established and maintained at the railroad company's wharf at Morehead City an automatic self-recording tide gauge, the zero of which was connected by spirit levels with the initial bench mark on the solid ground. The observations at this gauge were continued for one month, and synchronously there was read twice daily a tidal staff at Beaufort which was connected with the old United States Coast and Geodetic Survey tidal bench at that point, so that the benefit of the prior Coast Survey observations was gained by reduction, to add to the value of those recorded at Morehead City.

The instrument used was made by Messrs. Buff & Berger, of Boston, and differs from the ordinary spirit level in many particulars, the effect of which is to make it a high-grade instrument of precision. The rods used are of special design, 10 feet long and nonextensible, and were made by Messrs. W. & L. E. Gurley, of Troy, from selected white pine soaked in boiling paraffin (fig. 2). This line was run with two rods and rodmen, the latter setting on separate turning points. Instructions for the conduct of the work differed from those heretofore given in the following essential points:

The instrument was at all times shaded from the wind and sun; fore and back sights were of exactly equal length, and no sight over 300 feet in length was permitted. The instrument was unclamped from the tripod after the legs had been firmly set. Four steel turning points were used at the same time, two for each rodman, and they were so used that those employed for back sights were not withdrawn until the fore-sight pegs had been used; thus the line depended at no time on the stability of the instrument, as there were always two turning points in the ground. The limit of apparent error in the work was fixed at $.03\sqrt{\text{distance in miles}}$, which represents the allowable difference, in feet, in the elevations of any bench mark as determined by the duplicate lines. This limit is about as high as that set by other Government surveys for the best class of geodetic leveling. It is noteworthy that in the total length of double-rodded line, 457 miles, considered as a single-rodded closed circuit 914 miles in length, the extreme diversion of the two lines was 0.824 foot, equivalent in the formula to a constant of .027 foot, or well within the limits of error. It is further noteworthy that over the route followed the extreme differences in elevation were from sea level at Morehead City to 2,525 feet at the summit of Swannanoa Pass. In the following list are given the extreme divergences between the two rodded lines for every 50 miles run:

Distance.	Difference in elevation.	Distance.	Difference in elevation.	Distance.	Difference in elevation.
Miles.	*Feet.*	*Miles.*	*Feet.*	*Miles.*	*Feet.*
50	0.085	200	0.449	350	0.822
100	0.094	250	0.701	400	0.827
150	0.295	300	0.780	450	0.803

ATLANTIC SECTION OF TOPOGRAPHY.

In this section, under the general direction of Mr. H. M. Wilson, geographer in charge, nine leveling parties were engaged during the entire season in running lines of spirit levels for the control of the topographic work in the various localities.

VERMONT.

BENNINGTON COUNTY.

BENNINGTON QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the water table of front door of the county court-house in Bennington, marked "U. S. Geological Survey. Elevation 682 feet. B. M." The elevation of this bench mark above mean sea level is based on the top of rail of the Bennington and Rutland Railway in front of the railroad station at South Shaftsbury, the height of which was accepted as 720 feet, as brought by careful spirit levels from the Delaware and

Hudson Canal Company's railroad at Lake Champlain and adjusted thence through from sea level. In accordance with this height, the elevation of the central datum tablet in Bennington is accepted as 681.611 feet. The leveling was under the direction of Messrs. J. H. Jennings and A. M. Walker, topographers, and was done by Messrs. E. L. McNair and A. B. Pomme, levelmen.

As this quadrangle is situated by itself, surrounded by others the survey of which had been completed prior to the action of Congress calling for spirit leveling, it was realized that no additional leveling was likely to be done in its neighborhood, and therefore no effort was made to get closed circuits for adjustment, as the operation of so doing would have greatly increased the expense of the work. These elevations are therefore but preliminary, being unchecked except by the exercise of great care in their running.

BENNINGTON.

	Feet.
Bennington County court-house; bronze tablet in water table of front door, marked "682"	681.611
County and North streets; top of northerly marble hitching post in front of brick house in southwest corner of intersection	669.03
Bennington County National Bank building; northwest corner of lowest step at west entrance, in northeast corner of intersection of Main and North streets (Main street entrance)	678.83
Main and Bradford streets, chiseled circle corner of south end of stone wall	752.40

BENNINGTON TO BENNINGTON MONUMENT.

Bennington, near convent school and at foot of Monument Hill; square chisel mark on stone south side of road, 25 feet east of culvert on West Main street	663.41
Bennington Center; ringbolt in southernmost hitching post in front of first house (Shield's) on west side of Monument street above Hill road.	802.34
Bennington Monument; square chisel mark on northwest corner of door-sill	869.97
Bennington Monument, entrance to; bronze tablet at left side of doorway, marked "873"	873.181

BENNINGTON TO WOODFORD.

Wilson's (John) house; chiseled circle on small bowlder on south side of road beside board fence at east end of bars opening into yard	884.75
Wood's (Henry) house, 75 feet east of; bowlder south side of road near fence	1,071.36
Bennington, signboard "3½ miles from;" chiseled circle on top of bowlder 90 feet east of forks of road	1,154.33
Rooney's (John) house; 50 feet above gate leading to; chiseled circle on top of large bowlder underneath board fence	1,217.93
House, wood-colored (unoccupied) with four maple trees in front; chiseled circle on large irregularly shaped bowlder	1,338.22
Woodford, 2 miles west of; hardhead bowlder between red house and sawmill, 8 feet left of road	1,431.54
Woodford, 2 miles west of; bowlder, marked with chiseled circle, on side of road next to stream	1,601.43
Woodford, 1 mile west of; chiseled circle on bowlder 40 feet north of road, 25 feet below three old brick charcoal pits	1,899.97

	Feet.
Woodford; copper bolt in large flat bowlder nearly embedded in ground, 43½ feet from northwest corner of church on line with front of church; bolt is marked "U.S.G.S. 2,215 Ft. B.M."	2,215.076

WOODFORD TO HEARTWELLVILLE.

Woodford, 1½ miles east of, in front of J. W. Hagar's white house; round chisel mark on highest corner of stone horse block	2,322.21
Woodford, 2 miles east of, 160 feet from small wooden bridge; chiseled circle on top of large bowlder nearly embedded in the ground, 10 feet south of road	2,319.59
Woodford, 3 miles east of; chiseled circle on bowlder 5 feet north of road, 100 feet east of red sawmill	2,230.88
Woodford, 5 miles east of, summit of hill surmounted by house; round chisel mark on bowlder near corner of barn	2,267.71
Heartwellville, 4½ miles north of, at road corner; chiseled circle on top of bowlder 30 feet south of signboard	2,324.49
Heartwellville, 2½ miles north of; chiseled circle on bowlder about 10 feet east of center of road and 660 feet east of summit of hill	2,446.01
Heartwellville, Canedy's hotel; stone step at west end of porch, marked with chiseled circle	1,796.18

HEARTWELLVILLE TO STAMFORD.

Heartwellville post-office, east of; 2,100 feet west of Canedy's hotel on right of road; copper bolt in large bowlder, marked "U.S.G.S. 1,784 Ft. B.M."	1,783.822
Deerfield River bridge, fork of road 850 feet south of; chiseled circle on large bowlder	1,831.63
Heartwellville, 1½ miles south of; iron watering trough on left of road; highest point of rim where riveted	1,817.94
Heartwellville, 3 miles south of; chiseled circle on large bowlder left of road, 2,100 feet below school	1,507.09
Iron bridge, north end of east side 5 feet from corner; chiseled circle on top of rock abutment east wall	1,363.13
Cole's (Bennett S.) house, 1,000 feet north of; chiseled circle on top of large bowlder embedded deeply in ground, in meadow on right of road nearly in line with telegraph poles	1,233.10
Stamford, Paradise House, chiseled circle on top of bowlder at corner of stable opposite	1,173.51
Stamford, Methodist Episcopal parsonage; copper bolt in doorstep of front porch, marked "U.S.G.S. 1,131 Ft. B.M."	1,130.762

WOODFORD HOLLOW TOWARD GLASTONBURY.

Camp Comfort, 100 feet east of sawmill opposite; chiseled circle on top of large bowlder 100 feet north of road	1,266.82
Bowlder 5 feet from wagon track on right side of road nearly in front of house on same side of road; chiseled circle on highest point	1,366.60
Electric railway power house, 2½ miles from; copper bolt in bowlder containing about 1 cubic yard, 10 feet from corner of stable (last building before reaching old town of Glastonbury); bolt is marked "U.S.G.S. 1,672 Ft. B.M."	1,671.761

POWNAL CENTER TO POWNAL.

Pownal, Main street crossing of Fitchburg railroad; top of northernmost rail	548.55

	Feet.
Pownal, Methodist church, top of south retaining wall; square chiseled mark on coping	550.58
Pownal, Wright's knitting mill; southwest corner of brick storehouse	539.22
Pownal, wooden covered bridge over Hoosick River at; head of spike in northwest corner post	540.41
Pownal Center, three-fourths mile south of; first fence corner south of summit of road, bowlder 6 feet east of (on west side of road), square chisel mark	1,095.39
Pownal, red barn in southeast corner of road crossing; foundation stone under northwest corner, marked with chiseled square	692.30
Pownal schoolhouse; square chisel mark on stone at southeast corner of building	629.24

BENNINGTON TO POWNAL CENTER.

Bennington, one-half mile south of; large bowlder on east side of road at culvert, close to two ash trees 300 feet north of two dwellings; square chisel mark	805.03
Bennington, second milepost south of, at schoolhouse, at roads running northwest and southwest; bowlder on east side of road, chiseled square.	799.29
Bennington, 2¼ miles south of; foundation stone of culvert, marked with chiseled square, on east side of driveway 100 feet south of road running east	762.05
Bennington, 3 miles south of; bowlder showing 2 square feet of surface above ground, east side of driveway, 50 feet north of center of stream running north and 100 feet south of unpainted house; square chisel mark.	801.54
Bennington, 3¾ miles south of; stone arch culvert on east side of road 100 feet north of white house with three maples and one tamarack tree; square chisel mark on south wing parapet wall	833.86
Bennington, 4½ miles south of, at Dave Towslee's house; square chisel mark on bowlder under butternut tree in front of house	950.28
Bennington, 5 miles south of, at Pine Hill; intersection of road running east, just north of Pine Hill; square chisel mark in stone in northeast corner	968.93
Pownal Center; northwest corner of most northerly doorstep at Mary Lampman's house in southwest corner of road to North Pownal	977.83
Pownal Center church, 14.75 feet north of northwest corner and in line with front of; copper bolt, in rock, stamped "U.S.G.S. 986 Ft. B.M."	985.676

SOUTH SHAFTSBURY TO BENNINGTON.

South Shaftsbury; copper bolt, in foundation stone of west abutment, north wing of bridge over small brook; marked "U. S. G. S. 711 Ft. B. M."	710.83
South Shaftsbury Town Hall (formerly Free Universalist Stone Church); square chisel mark on southwest corner of doorsill	753.67
South Shaftsbury, ½ mile south of; square chisel mark on stone 4 feet southeast of corner fence post in southwest corner of intersection of main road and road running east, south of cemetery	737.41
South Shaftsbury, 1 mile south of; square chisel mark on top of cornerstone of stone fence in southeast corner of road east, opposite house with 6 black ash trees in front	788.09
South Shaftsbury, 1¼ miles south of; bent nail in east root of maple tree on west side of road, north of road running west, north of white clay factory and in front of dwelling house on corner	777.92
Bennington, 3 miles north of; schoolhouse (brick) 300 feet north of, at intersection of road running east; square chisel mark on lowest stone in southeast fence corner	788.87

	Feet.
Bennington, 3 miles north of; 120 feet below schoolhouse; square chisel mark on snubbing stone in northwest corner of road running west......	775.06
Railroad crossing, 75 feet north of; 200 feet south of road running east; nail in notched root of large elm tree on west side of road	605.28
Bennington Monument, 1 mile north of; bridge over Furnace brook; square chisel mark on top of coping, north abutment	585.44

NEW YORK.

MONTGOMERY, FULTON, HAMILTON, WARREN, AND ESSEX COUNTIES.

FONDA, GLOVERSVILLE, FAYVILLE, SPECULATOR, INDIAN LAKE, THIRTEENTH LAKE, NORTH CREEK, NEWCOMB, AND BLUE MOUNTAIN LAKE QUADRANGLES.

The elevations in the following list are based on a bronze tablet in the foundation stones of the county court-house at Fonda, marked "U. S. Geological Survey. Elevation, 294 feet. B. M." The elevation of this bench mark above mean sea level is obtained from the nearest permanent bench mark of the United States Engineer Corps precise-level line. As reduced in accordance with the latest information, the height of this is 293.129 feet. The leveling was done by Messrs. Clark Brown and A. F. Krause, levelmen, under the general direction of Messrs. W. H. Lovell and W. M. Beaman, topographers.

These elevations were originally based upon a bronze tablet in the quartz outcrop on the southeast side of the railroad track, 100 feet north of the North Creek Railroad station, marked "U. S. Geological Survey. Elevation, 1,012 feet. B. M.," the elevation of which is now accepted as 1,006.879 feet. This height was obtained through an adjustment of spirit levels brought via the Adirondack Railroad, which were found to be approximately 6 feet in error when the connection was made with precise levels near Fonda. In consequence, all of the bench marks established during the season of 1896 on these quadrangles and enumerated in this list are stamped with elevations 6 feet too high. Further levels to be run in this region will not be based on this North Creek datum, but on Fonda datum, to which these have been corrected.

AURIESVILLE TO GILMAN LAKE, VIA FONDA, GLOVERSVILLE, AND NORTHVILLE.

	Feet.
Schoharie Creek Aqueduct, Erie Canal; cross on cornerstone of northwest abutment of first bridge west of (U. S. Engineer Corps B. M.)..........	301.770
Auriesville, West Shore Railroad station, bridge over canal ⅜ mile west of; square chiseled in cornerstone, northwest end of west wing, north abutment..	302.31
Auriesville, West Shore Railroad station, bridge over canal ½ mile west of; cross cut in stone in fourth course north abutment, 1½ feet east of east angle of abutment	301.84
River Road crossing, south abutment of bridge over canal at; square chisel mark on northeast corner of east stone of third course	299.94
Fultonville, bridge over Mohawk River, ½ mile east of; top of stone monument on north side of river road	288.08
Fultonville, bridge over Mohawk River; square chisel mark on top of coping south abutment	293.53

	Feet.
Fonda, county court-house; cross on bronze tablet set in cornerstone of fourth course of stones from top of foundation at northwest corner, marked "294"	293.129
Cayadutta Creek, Fonda, Johnstown and Gloversville Railroad bridge over; square chisel mark in northeast corner of coping stone, southeast end of south abutment	350.08
Fonda, 2 miles north of; cross cut in face of stone in north wall of Fonda, Johnstown and Gloversville Railroad culvert No. 2	464.15
Sammonsville; Fonda, Johnstown and Gloversville Railroad station; cross cut in large stone at south corner of foundation	586.54
Sammonsville Railroad station, 1⅜ miles north of, on Fonda, Johnstown and Gloversville Railroad; cross cut in stone in face of southwest wall of culvert	649.51
Johnstown; Fonda, Johnstown and Gloversville Railroad crossing at Montgomery street, 60 paces northeast of; cross cut in stone, west corner of foundation of frame house on southeast side of street	648.55
Johnstown; Fonda, Johnstown and Gloversville Railroad station; cross on bronze tablet set in first stone below brickwork at west corner of building, marked "652"	651.238
Johnstown, 1⅜ miles north of, on Fonda, Johnstown and Gloversville Railroad; square chisel mark in southeast corner of top stone of west wall of culvert No. 2	722.13
Johnstown, 2½ miles north of, on Fonda, Johnstown and Gloversville Railroad bridge No. 5; square chisel mark on northeast corner of top stone, east end of abutment	748.81
Gloversville; square cut in southwest corner of stone in north abutment of bridge No. 6, Fonda, Johnstown and Gloversville Railroad, 100 paces from Main street	768.28
Gloversville; Fonda, Johnstown and Gloversville Railroad station; cross in bronze tablet set in first stone below brickwork 20 feet north of southwest corner of building, marked "798"	797.280
Gloversville, southeast corner of Bleecker street, near cast-iron post, bridge over Cayadutta Creek; square chisel mark in top of stone, south abutment	808.70
Gloversville, Kingsboro avenue, ⅜ mile west of Kingsboro Avenue station; square chisel mark on stone in east wall of culvert	850.17
Gloversville, Kingsboro Avenue, frame house on west side of, 100 feet north of railroad crossing; cross cut in stone near southeast corner of foundation	873.86
Gloversville, 2 miles north of Kingsboro Avenue station on Fonda, Johnstown and Gloversville Railroad; square cut in stone in west wall of cattle pass	812.78
Broadalbin Junction, top of frog in switch at	812.12
Broadalbin Junction, road crossing 500 feet northeast of	814.58
Anthonys Crossing, center of road at	792.18
Mayfield, 1 mile south of; northwest corner of west coping of arch culvert, square chisel mark	772.06
Mayfield; platform at railroad station	762.00
Mayfield; iron highway bridge, floor of	762.69
Mayfield; road crossing by gristmill	759.89
Mayfield; water surface mill pond, Mayfield Creek	754.09
Mayfield, 60 feet east of gristmill, 30 feet from creek, and 90 feet south of railroad track; copper bolt in bowlder 5 feet broad, marked "U. S. G. S.; B. M. 756 Ft."	751.159
Van Nostrands, 2,000 feet southwest of railroad station opposite northeast end of curve; square chisel mark on outcrop 15 feet west of track	743.96

	Feet.
Van Nostrands, road crossing at railroad station	741.79
Cranberry Creek, 2¼ miles south of railroad station; square chisel mark on bowlder 300 feet west of railroad track, half way to barn	740.13
Cranberry Creek, Main street, 300 feet north of railroad crossing and 100 feet west of railroad track; copper bolt in bowlder 3 feet high, marked "U. S. G. S.; B. M. 768 Ft."	762.533
Sweets Crossing, 200 feet north of, and 20 feet west of railroad track; square chisel mark on bowlder 8 feet broad	825.89
Sacandaga Park schoolhouse, ½ mile east of, 30 feet north of open culvert, 20 feet east of railroad; square chisel mark on bowlder	804.31
Sacandaga Park schoolhouse, ground elevation at base of	804.8
Sacandaga Park, ¼ mile south of; road crossing	810.9
Sacandaga Park, 125 feet south of road crossing at; bowlder 60 feet west of main line railroad, square chisel mark	813.03
Sacandaga Park; road crossing	807.4
Northville, Sacandaga River; floor of bridge over	761.79
Northville, Sacandaga River, bridge over; copper bolt in top step, north wing of west abutment marked "U.S.G.S.B.M. 765 Ft."	759.876
Northville railroad station, platform of	763.69
Northville, 1 mile above; square chisel mark on bowlder 4 feet west of road at south edge of clearing on west side of river	758.17
Van Vranken's (white) house; base of	769.0
West Stony Creek, first house (white) south of iron bridge over; base of.	785.9
Northville, 3 miles north of, 50 feet north of West Stony Creek iron bridge and on west side of river; square chisel mark on bowlder 10 feet west of road	786.43
Willard Cemetery; base of yellow house opposite, west side of river	789.9
Falls Brook, floor of bridge over	796.7
Sacandaga River, 40 feet from, on west bank; rock on south bank of brook, 20 feet west of road and 200 feet south of clearing, square chisel mark	782.28
Twenty-mile post, 150 feet north of; rock 20 feet east of road, marked "(B.M.○11.8)"	793.32
Mitchell's Hotel, south step of piazza; stone marked "B.M.○123" with chisel	806.27
Mitchell's white house; base of	806.3
Hope District Schoolhouse No. 4; base of	831.8
Hope District Schoolhouse No. 4, 75 feet west of; bowlder 15 feet north of road, copper bolt in, marked "U.S.G.S.B.M. 832 Ft."	827.021
Fifteen-mile post, 200 feet north of; bowlder 15 feet west of road, marked "B.M.○134"	890.00
Hotel, painted white, at southeast corner of road to east base of	900.3
Fourteen-mile post, 150 feet northeast of; bowlder at foot of hill, marked "B.M. 139" with chiseled circle	909.41
West River (West Branch of Sacandaga River), opposite mouth of; 300 feet south of 13-mile post, bowlder 50 feet east of river bank; square chisel mark	909.09
Wells tannery, 1½ miles south of; bowlder 15 feet east of road and 100 feet south of house, marked "B.M.○143"	953.86
Wells; 500 feet north of tannery, in flat; bowlder 20 feet east of road and 75 feet south of large barn, marked "B.M. 147" with chiseled circle	1,011.80
Wells; base of white church fronting west	1,009.0
Wells; base of yellow church with square-topped tower, fronting east	1,012.19
Wells; Hosley House; bronze tablet on rock 15 feet broad and 5 feet high in back yard of hotel, marked "1026"	1,020.940

	Feet.
Wells; east end of abutment of covered bridge, marked "B.M.B.X." with chiseled circle	987.40
Patent line monument in yard of white house opposite road to east; stone set in ground 15 feet southeast of house, marked thus △; triangle is 6 inches on each side	1,016.78
Elbow Bridge; stone 10 feet south of, and 4 feet west of road, marked "B.M. C.C." with chiseled circle	1,348.00
Hamilton Lake, angle of road to; bowlder 6 feet high and 15 feet broad, 40 feet from each road, west of junction, marked "B.M.A" with chiseled circle	1,692.04
Charley Lake, schoolhouse opposite; copper bolt in bowlder 8 feet broad, 25 feet southwest of school; bolt is marked "U.S.G.S.; B.M. 1719 Ft."	1,713.485
Charley Lake, water surface	1,692.17
Charley Lake; bowlder 25 feet southwest of schoolhouse opposite, marked "B.M. C.G." with chiseled circle	1,713.34
Gilman Lake outlet, 400 feet south of bridge over; bowlder 10 feet broad, 3 feet high, 40 feet east of road, marked with chiseled circle over legend "B.M. C.H."	1,669.75
Gilman Lake outlet, floor of bridge over	1,650.89
Gilman Lake, white house opposite center of; stone 100 feet south of building, 10 feet east of road, at trail to Griffin. This stone is marked with chiseled circle above legend "B.M.C.K." and is located 15 feet north of a stone marked in a similar manner with legend "B.M.C.J."	1,729.11

SPECULATOR TO JESSUPS RIVER, HAMILTON COUNTY.

Speculator, small triangular park at cross roads; copper bolt, set in bowlder (P 40 B 1), marked "U.S.G.S.; 1772 Ft. B.M."	1,767.200
Speculator, ¾ mile northwest of; square chisel mark on outcrop in forks of road, 6 feet from left-hand road, 20 feet from right-hand road, and 40 feet from fork	1,917.59
Echo Lake, fork of road to; chiseled cross on stone	1,931.24
Speculator, 1 mile north of; road surface at summit	2,039.9
Speculator, 1¼ miles north of; chisel mark on bowlder 5 feet east of road, opposite road south	1,948.06
Sacandaga Station Fish Hatchery, 125 feet south of; square chisel mark on bowlder 15 feet east of road 8 feet broad and 3 feet high	1,828.17
Sacandaga Station Fish Hatchery; ground at base of building	1,822.8
Sacandaga Station Fish Hatchery; floor of north bridge at	1,820.49
Sacandaga Station Fish Hatchery, 1 mile north of; square chisel mark on outcrop at height of land 400 feet south of 3-mile mark and 6 feet to left of road	2,015.01
Three-mile mark, 700 feet north of; road surface at summit	2,023.01
Speculator, 3¼ miles from, at head of path to Whittaker Lake House; chiseled cross on bowlder	1,996.26
Sacandaga Station Fish Hatchery, 2¼ miles north of; square chisel mark on bowlder 2 feet high and 6 feet broad, 4 feet east of road, 100 feet north of 2-acre clearing	1,913.08
Jessups River bridge; summit south of	2,013.6
Jessups River bridge; floor of small bridge ⅛ mile south of	1,672.1
Jessups River bridge; floor of	1,679.09
Jessups River bridge, 50 feet west of, on north bank of river; copper bolt in outcrop, 5 feet above center of bridge, marked "U.S.G.S.; 1689 Ft. B.M."	1,683.843

JESSUPS RIVER TO LEWEY RIVER.

	Feet.
Camp Perkins; piazza floor	1,697.39
Camp Perkins, ¼ mile from, at forks of Lewey Lake and Cedar Lake roads; nail in balsam stump 35 feet east of guideboard and 12 feet north of road	1,718.03
Camp Perkins, 1¾ miles north of and at south edge of valley 600 feet wide; birch stump, 2 feet in diameter 10 feet west of road marked "EL. 1756.335 Ft."	1,751.24
Mason Lake stream; floor of bridge over	1,712.69
Camp Perkins, 2¼ miles from and 300 feet southwest of Mason Lake boat landing; square chisel mark on bowlder 5 feet west of corduroy road running parallel to Mason Lake outlet	1,799.99
Mason Lake; water surface	1,793.29
Mason Lake, head of; bowlder opposite, 120 feet northeast of birch tree 3 feet in diameter; tree is 3 feet east and bowlder 10 feet west of road; square chisel mark	1,811.66
Mason Lake, 1¼ mile north of head of; square chisel mark on wedge-shaped stone 4 feet broad in road, due west of notch in high ridge ¾ mile distant, to the east	1,723.5
Lewey Lake house (McCormick); piazza floor	1,661.89
Lewey Lake, 100 feet from low-water line on south shore of, and 300 feet north of Lewey Lake house; copper bolt, in bowlder 8 feet broad, marked "U.S.G.S. 1659 Ft. B.M."	1,653.795
Lewey Lake; elevation of water service with dam open	1,650.44
Lewey Lake House (McCormick's), 1¼ miles north of; square chisel mark on bowlder 2 feet to right of road, 25 feet north of corduroy 175 feet long	1,660.94
Lewey River Bridge, 50 feet north of, at head of Indian Lake flow; square chisel mark on outcrop 5 feet west of road	1,637.01
Lewey River; water service at head of Indian Lake flow	1,626.05

LEWEY RIVER TO INDIAN LAKE.

Willow Creek bridge, 75 feet west of; square chisel mark on bowlder 5 feet north of, and 3 feet above road	1,642.00
Willow Creek bridge; floor of	1,632.49
Farrington's, 400 feet southwest of road to; square chisel mark on bowlder 2 feet high, 4 feet broad, 12 feet west of road	1,823.88
Griffin Shanty Brook, 300 feet northeast of; square chisel mark on outcrop east of road at top of hill	1,766.35
Beaver Meadow Brook bridge, 900 feet southwest of; outcrop, 3 feet above and 20 feet north of road, marked (1799 Ft.), copper bolt, "U.S.G.S. B.M."	1,793.943
Beaver Meadow Brook; floor of bridge over	1,790.49
Griffin's large white house; elevation of ground at base of	1,795.4
Beaver Meadow Brook, 1¼ miles northeast of; elevation ground surface at base of	1,689.6
Beaver Meadow Brook, 1¼ miles northeast of; bowlder 6 feet broad and 3 feet high, 50 feet north of road in barnyard, square chisel mark	1,682.59
Washburn's (F.) white house; base of	1,724.8
McCormick's Hotel (three story), 100 feet south of; square chisel mark on bowlder 6 feet broad, 5 feet above and 20 feet north of road	1,758.18
Indian Lake, west side of; base of schoolhouse	1,687.9
Squaw Brook, floor of bridge over	1,668.79
Lock's three-story house; floor of piazza	1,712.69

	Feet.
Sabael post-office; bowlder 8 feet broad and 1 foot high, 6 feet south of path from Lock's house to boat landing, two-thirds of distance to and 50 feet above lake; marked with chiseled circle and letters "B.M."	1,663.46
Sabael post-office, 1 mile north of; square chisel mark on small bowlder opposite log house, 10 feet west of road, 20 feet east of well, 150 feet south of small stream running into Indian Lake	1,715.59
Christian Hill, south of; floor of sluice bridge	1,691.59

LEWEY RIVER TO THAYER'S CAMP.

Old log camp, 300 feet west of; birch tree 2 feet in diameter, 5 feet south of road, marked "El. 1759.552"	1,754.44
Lewey River bridge, 2⅝ miles from; beech tree 12 inches in diameter, 10 feet north of road, and 50 feet east of road to southwest	2,251.88
Thayer's lumber camp (house), 50 feet northeast of; birch tree 15 inches in diameter, marked 2492.251	2,487.13
Thayer's shanty, on lot No. 42, west of Lewey Lake; bowlder midway between house and barn, marked with square chisel mark and figures (El. 2488.88 Ft.) cut in the stone	2,483.76

KINGS FLOW DAM TO ROSS (KUNJAMUCK).

Kings Flow Dam, 500 feet northwest of bridge at; bowlder 10 feet to right of and 1 foot above road. Copper bolt marked "U.S.G.S. 1724 Ft. B.M."	1,718.847
Round Pond Clearing, 15 feet south of; square chisel mark on rock 4 feet west of and 2 feet above road	1,886.95
Round Pond Clearing, 1¼ miles south of, 60 feet north from small brook; square chisel mark on bowlder 6 feet west of and 2 feet above road	1,915.93
Round Pond, 3 miles south of, at half-acre clearing; outcrop in brook; square chisel mark on point 4 feet upstream from small bridge	1,906.73

ROSS TO SPECULATOR.

Ross's Kunjamuck House, 2,000 feet south of; copper bolt in bowlder 4 feet by 6 feet by 2 feet, 8 feet east of road, marked "U.S.G.S. B.M. 1774 Ft.".	1,769.206
Cisco Brook, 100 feet south of; square chisel mark on bowlder 1 foot above and 4 feet west of road	1,768.14
Silver Brook, 10 feet south of; square chisel mark on bowlder 8 feet west of road	1,834.67
Rylander clearing, west of Elm Lake; copper bolt, in flat outcrop 6 feet west of road, 300 feet south of house foundation, and 1,000 feet north of top of hill in road; bolt marked "U.S.G.S. B.M. 1952 Ft."	1,946.823
Log house, 300 feet south of, in clearing opposite gravel pit; square chisel mark on bowlder 20 feet east of road and 4 feet from forked cherry tree	1,907.52
Speculator, 1 mile north of; square chisel mark on bowlder 3 feet above and 6 feet west of road, opposite small house 200 feet south of north end of clearing on west side of road	1,787.17

SPECULATOR TO GILMAN LAKE.

Speculator, 1 mile south of; bowlder 6 feet west of 1-mile post and 5 feet south of road, 150 feet west of path leading south to spring; square chisel mark	1,739.70
Speculator, 1¼ miles southeast of; outcrop on height of land, 20 feet north of road, marked with chiseled circle and letters "B.M.C.R."	1,808.22
Speculator, 2 miles southeast of; square chisel mark on bowlder 2 feet east of 2-mile post, 5 feet south of road, 125 feet west of sluice	1,758.78

	Feet.
Speculator, 3½ miles east of; outcrop on summit and 3 feet north of road, marked with chiseled circle and letters "B.M.C.R."	1,854.95
Gilman Lake, near head of; 200 feet north of hotel; square chisel mark on bowlder 3 feet above and 5 feet east of road	1,688.16

TRAIL, GILMAN LAKE TO GRIFFIN.

Dunning Pond, ½ mile east of; square chisel mark on bowlder 15 feet west of forks of road and 5 feet south of road	1,664.38
Auger Vlae, north side of; square chisel mark on bowlder in center of road, 10 feet from side of vlae and 5 feet from leaning maple 20 inches in diameter	1,630.62
Griffin; 2 miles north of; square chisel mark on bowlder 5 feet east of road on left bank of Lake Pleasant stream, opposite Auger Flat dam	1,367.95
Griffin; copper bolt in rock 5 feet north of road, 5 feet south of river, and 30 feet above milldam, marked "U.S.G.S. B.M. 1280 Ft."	1,274.779

NORTH CREEK TO NORTH RIVER.

North Creek, 100 feet north of railroad station; bronze tablet in quartz outcrop on southwest side of track, 2 feet above track and about 6 feet from southwest rail, marked "1012"	1,006.879
North Creek, 1,000 feet north of railroad station; point in chiseled square on flat surface of quartz outcrop, 3 feet above tracks and 6 feet southwest of southwest rail	1,007.97
North Creek, wild-apple tree opposite white farm house ½ mile north of railroad station; tree is 40 feet south of road to house, is blazed, and the point of elevation is a nail driven in notch in root	1,003.72
North Creek railroad station; 1 mile north of at height of land in road, near blazed telegraph pole opposite gate, and 400 feet east of house with single chimney; point is center of square chisel mark on small rock 45 feet south of road, 6 feet behind larger and higher rock	1,038.27
Large rock 10 feet west of last-described bench mark and 25 feet from fence; square chisel mark	1,041.38
Lone elm tree, 60 feet high, 300 feet north of house, 20 feet above river and 200 feet back from river; blazed; top of spike in notch cut on root.	1,014.16
North Creek railroad station, 2 miles from; square chisel mark on large flat rock 6 feet broad, 15 feet west of road, behind blazed elm tree	1,024.19
North Creek, 2½ miles from; opposite large white house with sun parlor in front; bench mark on highest rock in vicinity, 20 feet from main road and 50 feet from fence	1,029.82
North River, 1½ miles south of; square chisel mark on large bowlder inside of fence on west side of road in front of log house	1,052.41
North River, 1 mile south of; square chisel mark on broad sloping outcrop at top of 4-foot fall in road; the mark is 15 feet west of road, 25 feet east of edge of outcrop, 2 feet from end of 5-inch step in rock, and 3 feet north of intersection of two well-defined seams	1,046.86
North River, 1 mile south of and 50 feet from old road; square chisel mark on pyramid-shaped rock 1 foot to right of wagon track	1,049.12
North River, ½ mile south of; wire nail driven in top of oak stump connected to standing oak tree 8 inches in diameter at corner of garden in front of house	1,051.94
North River, Thirteenth Creek bridge at; extreme southeastern corner of southeastern wall plate (corner of plate bent upward)	1,073.19
North River; copper bolt in bowlder 40 feet west of northwest corner of Thirteenth Creek bridge, 30 feet east of corner of house; bolt is marked "U.S.G.S. B.M. 1076 Ft."	1,071.088

	Feet.
North River, 300 feet west of bridge at; top of copper bolt under tripod signal of Adirondack Survey—Triangulation Signal No. 118, 1882. (This signal is said to mark Warren-Essex county line)	1,079.76

NORTH CREEK TO SODOM.

North Creek, Adirondack Hotel; top of fire hydrant at corner of barn	1,028.24
Bakers Mill Pond, southwest edge of casting under southwest corner of bridge over North Creek	1,015.69
North Creek railroad station, ¾ mile south of; square chisel mark on quartz outcrop 15 feet to left of and 4 feet above road, 300 feet north of yellow house, and 50 feet southeast from a similar outcrop	1,027.28
Road to southwest, 150 feet south of; square chisel mark on rock 4 feet high and 8 feet broad on the left of road	1,036.34
North Creek railroad station, 2 miles from; 300 feet east of yellow barn, on left of road, on bank of creek; square chisel mark on bowlder 10 feet long 7 feet broad and 2 feet high	1,054.80
North Creek, 2½ miles south of, 300 feet south of schoolhouse; square chisel mark on outcrop 60 feet west of large barn, 10 feet left of road, 2 feet above road, 30 feet from junction of garden and road fences	1,091.02
North Creek railroad station, 3 miles south of, and 100 feet from last-described bridge; point in chisel mark 1 foot from south edge of large sloping bowlder, and 5 feet from ground measuring along slope	1,102.70
Outcrop 150 feet north of place where road is built on cribbing; circular chisel mark and letters "B.M.E.," 2 feet from fence	1,126.64
Bowlder, 4 feet to left of and 2 feet above road opposite road to west; marked with circular chisel mark and letters "B.M.F."	1,167.12
Sawmill, 100 feet beyond, and 20 feet beyond sluice bridge; square chisel mark on bowlder 5 feet left of road	1,192.87
House (small, red), 200 feet south of; bowlder 20 feet to right of road, marked with chiseled circle and letters "B.M.G."	1,226.70
Sodom, ⅜ mile from; bowlder on right side of road, 60 feet from road fence and 20 feet south of stone wall, marked with circular chiseled mark and letters "B.M.I."	1,350.68
Sodom Post-office, 10 feet from and 10 feet to left of road; flat, circular rock, level with road, marked with circular chisel mark and letters "B.M.J."	1,443.47

SODOM TO BAKERS MILLS.

Ross Mill, 6 feet left of road to, 60 feet from main road; square chisel mark on bowlder 2 feet above main road	1,498.33
Ross Mill, 500 feet beyond road to, and 15 feet north of large pine tree 30 inches in diameter; large bowlder on right of road, marked with circular chisel mark and letters "B.M.O."	1,530.18
Sodom and Bakers Mills, on road between; 500 feet from height of land, 8 feet from small sluice bridge; bowlder 10 feet broad, 6 feet high, marked with circular chisel mark and letters "B.M.P."	1,571.43
Sodom and Bakers Mills, road between; south of road to house, 200 feet to the right of main road; bowlder 6 feet broad and 2 feet high, marked with chiseled circle and letters "B.M.Q."	1,568.66

BAKERS MILLS TO MOUNTAIN HOUSE.

Bakers Mills, 50 feet north of blacksmith shop and 25 feet to right of road; bowlder 6 feet broad and 1 foot below surface of road, marked with chiseled circle and letters "B.M.S."	1,579.94

	Feet.
Bakers Mills, 50 feet north of blacksmith shop and 25 feet west of road; copper bolt in bowlder 6 feet broad and 2 feet above ground, marked "U.S.G.S. B.M. 1585 Ft."	1, 579. 873
Bakers Mills; bowlder at forks of road to west, marked with chiseled circle and letters "B.M.U."	1, 587. 24
Bakers Mills, Foley's Hotel; opposite and on south side of road to west, and west of north-and-south road; square chisel mark on flat bowlder level with surface of road	1, 590. 86
Bowlder on right of road at junction of road to north, marked with chiseled circle and letters "B.M.X."	1, 639. 89
No. 11 Creek bridge, top of hill ¼ mile west of; square chisel mark on bowlder 5 feet to left of road	1, 725. 45
Barn, small, 40 feet southeast of and 50 feet west of bridge; bowlder 10 feet to right and 1 foot above road, marked with chiseled circle and letters "B.M.Y."	1, 711. 77
House (white) 100 feet southwest from and ¼ mile east of height of ground; bowlder 15 feet long and 6 feet high, 20 feet left of road, marked with chiseled circle and letters "B.M.Z."	1, 818. 63
Summit 50 feet east of west end of small meadow; 25 feet east of a bowlder 10 feet broad and 4 feet high; bowlder 25 feet left of road marked "B.M.A.A." with chiseled circle	1, 907. 22
Thirteenth Lake, ¼ mile east of fork of road to; bowlder 6 feet to left of road opposite log house, square chisel mark	1, 830. 35
Thirteenth Lake, at fork of road to; bowlder 8 feet above left-hand road 50 feet west of point of junction of roads, marked with circle and letters "B.M.A.D." with chisel	1, 784. 42

MOUNTAIN HOUSE TO THIRTEENTH LAKE.

Diamond Mountain brook, 15 feet west of west bridge over; nail in notch on root of large three-pronged elm tree. Blaze above nail is marked "B.M. El. 1607.60"	1, 602. 49
Curtis Clearing, opposite road to; spike in knot of wild cherry tree 15 feet to right of road. Blaze below marked "B.M.E. 1635.804"	1, 630. 69
Outcrop near center of old clearing, 15 rods southeast from log shanty, 250 feet east from brook, 200 feet east from cellar of burned house; square chisel mark 3 feet to left of road	1, 638. 69
Siamese ponds, junction of road to, with road from Mountain House to Thirteenth Lake; 20 feet east of junction and 15 feet left of road; notch on root of large elm tree, blazed and marked "B.M. El. 1649.899"	1, 644. 7
Big Shanty Dam, 200 feet southeast from east end of; copper bolt, set in bowlder 3 feet high and 8 feet broad, marked "U.S.G.S. 1666 Ft. B.M."	1, 661. 214
Big Shanty Dam, ¼ mile north of; square chisel mark on bowlder 8 feet west of and level with road in northern edge of upper clearing 100 feet south of edge of woods	1, 673. 88
Big Shanty Dam, 1 mile north of, and ¼ mile north of upper clearing; north of bridge with 20-foot span, big birch tree on left of road, notched, blazed, and marked "B.M. El. 1703.375"	1, 698. 2
Thirteenth Lake House, 1¼ miles from; on left of road in angle of wood road to southwest, 25 feet south of wood road running east to river and 50 feet south of small brook; balsam 10 inches in diameter marked "B.M. El. 1759.853"	1, 754. 7
Thirteenth Lake House; 75 feet in front of; copper bolt, set in low flat outcrop, marked "U.S.G.S. 1874 Ft. B.M."	1, 868. 592
Thirteenth Lake; at foot of trail from east side of Maxam's barn, on shore of lake 50 feet from water's edge, 3 feet to right of straight trail and 4 feet above trail; large bowlder, marked "U.S.G.S." and chiseled square	1, 694. 29

THIRTEENTH LAKE TO KINGS FLOW DAM.

	Feet.
Hour Pond brook; square chisel mark on outcrop at north end of lower bridge across	1,729.23
Hour Pond brook, 100 feet east of upper bridge over; square chisel mark on outcrop in road	1,896.02
Puffer Pond, foot of; square chisel mark on broad flat rock in road, 100 feet north of point in road which is opposite outlet of pond, and 40 feet from the outlet	2,189.95
Puffer Pond road, junction of, with road from Kings to Humphrey clearing; maple 2 feet in diameter in southeast corner of roads, blazed and marked "B.M. El. 1834.132"	1,829.01
Puffer and Kunjamuck roads, junction of; 500 feet northwest from; square chisel mark on bowlder 5 feet to right of and 2 feet above road	1,718.83
Kings Flow Dam, 500 feet northwest of bridge at; copper bolt in bowlder 10 feet to right of and 1 foot above road, marked "U.S.G.S. 1724 Ft. B.M."	1,718.847

KINGS FLOW DAM TO COPPER BOLT SOUTH OF INDIAN LAKE VILLAGE.

Spring, 40 feet east of, on outcrop 100 feet north of house and 5 feet left of road, marked with chiseled square	1,834.12
Forks of road, 30 feet west of; square chisel mark on bowlder 4 feet broad, 5 feet to right of road	1,683.01
Bridge, 50 feet north from; on bowlder 4 feet high, 8 feet broad, and 6 feet to right of road; square chisel mark	1,674.44
Schoolhouse (red), opposite; square chisel mark on outcrop 10 feet south of road and 20 feet west of bridge	1,628.57
Beaver Meadow Brook, iron bridge over; top of rivet 2 inches from northwest corner of northwest wall-plate	1,605.19
Indian River bridge, 25 feet east of; square chisel mark on bowlder 8 feet broad, 3 feet high, 20 feet north of road	1,597.74

GRIFFIN TO MOUNTAIN HOUSE.

Griffin Flow Dam, 150 feet southeast of; bowlder 5 feet north of road, marked with chiseled circle, letters "B.M. B.B." and "1306 Ft."	1,300.55
Griffin, 1 mile east of and ½ mile east of isolated barn; bowlder 2 feet south of and above road, 5 feet west of conspicuous bowlder; mark: A chiseled circle and letters "B.M. B.A."	1,286.29
Griffin, 2 miles from, toward Oregon; bowlder 500 feet south of log house, opposite point of woods, 15 feet east of and 4 feet above road, marked with chiseled circle and letters "B.M. A.Y."	1,299.94
Griffin, 3½ miles northeast of, 50 feet west of height of land; bowlder 10 feet broad and 3 feet high, 15 feet west of road, marked with chiseled circle and letters "B.M. A.V."	1,352.23
Hamilton-Warren county line, 1 mile northeast of; bowlder in road 50 feet southwest of small brook, marked with square chisel mark and "El. 1365"	1,360.38
Narrows, 300 feet north of summit at; bowlder on right of road, marked with chiseled circle and letters "B.M. A.Q."	1,367.35
Oregon, 2 miles southwest of and 75 feet south of Stuarts Creek bridge; highest point on unmarked bowlder 20 feet east of road	1,366.66
Stuarts Creek, 300 feet northeast of, point 5 feet west of road on outcrop; copper bolt marked "U.S.G.S. 1377 Ft. B.M."	1,371.971
Oregon, ½ mile southwest of; bowlder 500 feet north of Johnsons Creek bridge and 5 feet west of road, marked with chiseled circle and letters "B.M. A.N."	1,383.31

	Feet.
Oregon, 300 feet south of dam, point on outcrop 10 feet west of road, marked with chiseled circle and letters "B.M. A.L."	1, 411. 23
Oregon, 1,000 feet north of the North House (McKlosky's) and 150 feet north of curve to right in road; bowlder 5 feet broad, 10 feet to right of road; copper bolt marked "U.S.G.S. B.M. 1435 Ft."	1, 429. 836
Mountain House, clearing 1 mile south of; bowlder 40 feet west of road, 200 feet south of log barn and 400 feet east of small pond, marked with square chisel mark	1, 586. 28

NORTH CREEK TO MINERVA.

North Creek, Hudson River bridge; upstream end of north abutment, marked with chiseled circle	1, 005. 31
North Creek, 1 mile northeast of bridge over Hudson River and ⅞ mile south of junction of road leading to east; square chisel mark on bowlder 11 feet to left of, and 1.5 feet above center of road	1, 166. 85
North Creek, 2¼ miles north of bridge over Hudson River and 1,100 feet south of junction of road leading to west; bowlder 30 feet to right of and 5.8 feet above center of road, 150 feet west of north of new house on hill; mark, a chiseled square	1, 087. 07
Minerva, 3¼ miles southeast of, near county line; bowlder 30 feet to left of and 1.4 feet above center of road, marked with chiseled circle and "U 2"	1, 276. 98
Minerva, 3 miles southeast of, at junction of road leading to Olmstedville; square chisel mark on pointed bowlder 9 feet to left of and 2 feet above center of road	1, 218. 72
Minerva, 1 mile southeast of and ⅜ mile south of crossroads; square chisel mark on bowlder 6 feet to right of and 1.2 feet above center of road	1, 341. 33

NORTH RIVER TO INDIAN RIVER, VIA SUMMIT.

North River, ¾ mile north of; square chisel mark on pyramid-shaped rock on right of road at foot of big hill, 10 feet south of maple tree 10 inches in diameter and 200 feet north of house	1, 086. 96
One-mile post, square chisel mark on bowlder by	1, 175. 72
North River, 1¼ miles northwest of on level stretch of mountain road; square chisel mark on highest point of prominent bowlder, 6 feet to left of and 5 feet above road, 50 feet northwest of small swamp	1, 324. 28
North River, 1¾ miles northwest of point in circle on rock 15 feet to left of and 5 feet above road by spring; marked with a chiseled circle and "117".	1, 354. 53
Two-mile post, 100 feet beyond; square chisel mark on highest corner of sloping rock 3 feet broad, 15 feet to the left of road opposite small sluice bridge	1, 560. 40
Barbers Mill, opposite road to; square chisel mark on rock 30 feet to left of road	1, 654. 34
Barber Pond, floor of sluice bridge at west end of	1, 652. 7
Three-mile post, floor of sluice bridge at	1, 708. 7
North River, 3¼ miles northwest of; square chisel mark on prominent bowlder in clearing on right, and 60 feet from road, 150 feet south of log house.	1, 728. 69
North River, 3¾ miles northwest of; square chisel mark 10 feet beyond the highest point of low outcrop 8 feet to right of and 2 feet above road, 25 feet south of creek and 100 feet east of wood road at top of slight rise in flat	1, 751. 17
North River, 4¼ miles northwest of, on short flat at Casey's; square chisel mark on large bowlder 6 feet broad, 3 feet high, 40 feet to left of and 1 foot below road, 8 feet east of barn	1, 882. 15
North River, 4¾ miles northwest of; square chisel mark on flat outcrop 15 fees to left of and level with road at summit	1, 983. 05

	Feet.
Five-mile post, 20 feet west of; square chisel mark 10 feet to left of and 2 feet above road on outcrop	1,908.95
North River, 5½ miles northwest of; square chisel mark on rock 5 feet to right of center of road, 1 foot above road, 40 feet west of height of road, and 300 feet beyond clearing	1,913.88
Six-mile post, 400 feet west of; square chisel mark on large bowlder 7 feet broad, 25 feet to left of and level with road	1,839.51
North River, 6¼ miles west of, on flat 700 feet west of log barn; square chisel mark on bowlder 10 feet broad, 6 feet to right of and 3 feet above center of road	1,788.74
Seven-mile post, 500 feet west of; square chisel mark on rock 6 feet broad and 10 feet to right of road, at height of land	1,803.37
Tucker's (Fred.) house, northeast corner of, 40 feet northeast of; square chisel mark on rock 10 feet to left of road	1,814.44
Eight-mile post, 300 feet west of, point in highest part of; square chisel mark on rock 8 feet left of road and 4 feet above road; 4 feet east of this rock is another rock 1½ feet higher; across road is a bowlder 18 feet long, 10 feet broad, and 12 feet high	1,755.20
North River, 8½ miles west of, at east foot of Stonystep Hill; rock 4 feet high 2 feet above road, marked with a chiseled circle and "B.M.108."	1,747.74
North River, 9½ miles west of; square chisel mark on projection at base of outcrop on north side, 40 feet to left of road, 50 feet from well, 75 feet beyond house	1,887.48
Flat, 500 feet west of house, 15 feet beyond farm road; rock 10 feet to right of and 2 feet above road, marked with chiseled circle, also on back of rock "B.M. 107."	1,863.10
Spring's white house, copper bolt southeast of, in outcrop in front of log house, 10 feet to left of and 2 feet above road; bolt marked "U.S.G.S. B.M. 1834 Ft."	1,828.88
Spring's white house, 200 feet west of, at junction of road to Pond with main road; square chisel mark on bowlder 15 by 15 by 6 feet in northwest corner of roads	1,808.59
McGinn's (John) house, opposite road running south from; square chisel mark on bowlder 15 feet to right of and level with road	1,801.56
Indian River bridge, ⅛ mile east of, near new house; rock 10 feet broad 12 feet to left of and 4 feet above road, marked with circle and letter "C;" also, "S.P." Elevation of point in circle	1,622.20

MINERVA TO AIDEN LAIR.

Minerva; copper plug set in large bowlder at north end of picket fence southeast of Kellogg House; said bowlder is about 15 feet to the right of and 1.5 feet above road, and the bolt is marked "U.S.G.S. 1393 Ft. B.M."	1,387.84
Minerva, 200 feet east of, south of Jones's store; bowlder 6 feet to right of and 1.2 feet above center of road, marked with chiseled circle and figures "23"	1,353.96
Minerva, ¾ mile northwest of and ¼ mile south of round iron watering trough; bowlder 5 feet to right of and 1 foot above center of road, at junction with road leading to left, marked with chiseled circle and "B.M. 24"	1,432.82
Minerva, 1 mile northwest of Kellogg House; bowlder 10 feet to left of road and 2.1 feet above road; mark, chiseled circle and "B.M. 25 feet".	1,468.78
Minerva, 1¾ miles north of Kellogg House at junction with road to North Woods Club, 80 feet east of, south of schoolhouse; copper plug set in outcrop 26 feet to right of and 7.5 feet above center of road, marked "U.S.G.S. 1742 Ft. B.M."	1,736.685

	Feet.
Minerva, 2⅝ miles north of Kellogg House, summit in road ⅛ mile south of Rockdale; outcrop 10 feet to right of and 1.4 feet above road, marked with chiseled circle and "B M. 28"	1,795.76
Minerva, 2⅜ miles north of Kellogg House and ⅛ mile north of Rockdale; outcrop 20 feet to left of and 5 feet above road, marked with chiseled square	1,800.24
Aiden Lair, 2¼ miles south of and ¼ mile south of junction of road to Boreas River (below); outcrop 9 feet to left of and 1.6 feet above center of road; mark, a chiseled circle and "B.M. 34"	1,960.27
Aiden Lair, 2 miles south of, near junction of old Pendleton road to Boreas River; outcrop 8 feet to left of and 1.8 feet above road at summit of long rise in road; mark, chiseled circle and "B.M. 35"	1,898.81
Aiden Lair, ¾ mile south of and 400 feet south of junction of path leading to Balfour Pond; bowlder 10 feet to right of road at point about 10 feet south of pole culvert; square chisel mark	1,797.67
Aiden Lair Lodge, 50 feet southeast of; copper plug in bowlder, marked "U.S.G.S. 1659 Ft. B.M."	1,653.853

AIDEN LAIR TO NEWCOMB.

Aiden Lair Lodge, ¾ mile from; bowlder 6 feet to left of and 1.8 feet above center of road; mark, a chiseled circle and "41"	1,686.15
Boreas River iron bridge, 530 feet beyond; square chisel mark on outcrop 8 feet to left of and 2 feet above center of road	1,632.38
Mile post marked "25 miles to Long Lake," 750 feet beyond; square chisel mark on bowlder 10 feet to right of and 0.1 foot above center of road, near top of long rise in road	1,753.25
Kays' (William L.) house, ¼ mile back from; rock outcrop 9 feet to right of and 1 foot above center of road; mark, a chiseled circle and "B.M. 46"	1,800.64
Kays' (William L.) house, schoolhouse north of; 100 feet west of north of schoolhouse; square chisel mark on outcrop 6 feet to right of and 1 foot above center of road	1,701.78
Van der Whacker Brook, 175 feet north of; bowlder 6 feet to right of and 3.4 feet above center of road; mark, a chiseled circle and "48"	1,612.84
Van der Whacker Brook, outcrop 6 feet to left of and 0.3 feet above center of road at summit of long rise west of; 400 feet back from 23-mile post; mark, a chiseled circle and "B.M. 49"	1,751.85
Twenty-three-mile post; bowlder ¼ mile north of, 8 feet to right of, and 1.7 feet above center of road; mark, a chiseled circle and "B.M. 50"	1,753.38
Havron's (Daniel) house, 560 feet southeast of; square chisel mark on large bowlder 14 feet to right of and 6.3 feet above center of road	1,785.27
Havron's (Daniel) house, ⅜ mile beyond; copper plug in large bowlder 12 feet to left of and 2.8 feet above center of road, marked "U.S.G.S. 1737 Ft. B.M."	1,731.946
Tahawus Short Cut, 1,000 feet back from barn, on right of road; square chisel mark on outcrop 8 feet to left of and 0.2 foot above center of road.	1,662.70
Tahawus, ½ mile west of fork of road to; square chisel mark on large bowlder, 7 feet to left of and 2.7 feet above center of road, 60 feet east of bridge over Hyslop Brook	1,636.54
Parker's (Samuel) house; square chisel mark on bowlder opposite; 12 feet to left of and 3.7 feet above center of road	1,660.06
Nineteen-mile post, ⅜ mile beyond; square chisel mark on bowlder 11 feet to right of and 1 foot above center of road at top of small rise	1,653.84
Boles' (William) house, 300 feet northwest of; square chisel mark on large bowlder 8 feet to right of and 7.1 feet above center of road	1,674.99
Seventeen-mile post; square chisel mark on bowlder near fence in front of log house on right of road	1,582.34

	Feet.
Hudson River Bridge; square chisel mark on top of coping at downstream end of west abutment	1,562.50
Sibley's garden, west of house; square chisel mark on bowlder at southwest corner of, between fence and road	1,589.30
Newcomb Methodist Church; copper plug in outcrop 85 feet northeast of door of; 16 feet to left of and 1.3 feet above center of road, marked "U.S.G.S. 1640 Ft. B.M."	1,636.135
Newcomb Hotel, ⅛ mile northeast of; square chisel mark on upstream end of east abutment of iron bridge over creek	1,560.63

NEWCOMB TO HAMILTON—ESSEX COUNTY LINE.

Newcomb Hotel, ½ mile west of; square chisel mark on bowlder 7 feet to right of and 0.1 foot above center of road at end of clearing	1,616.42
Cemetery, near summit ¼ mile west of; square chisel mark on bowlder 7 feet to right of and 2.5 feet above center of road	1,639.96
Beldin's (Abner) house, 460 feet back from; square chisel mark on large bowlder 14 feet to right of and 3.8 feet above center of road	1,598.55
Beldin's (Abner) house, copper bolt near, on above described bowlder; mark, "U.S.G.S. 1603 Ft. B. M."	1,598.304
Schoolhouse, ½ mile back from; square chisel mark on bowlder 8 feet to left of and 0.4 foot above center of road, 550 feet beyond white frame house on right of road	1,628.60
Sheldon's house, ⅛ mile beyond; square chisel mark on outcrop, 6 feet to right of and 1 foot above center of road, 840 feet beyond bridge over brook	1,580.02
Lily Pad Pond; square chisel mark on flat bowlder 8 feet to right of and 0.3 foot above center of main road at junction with road	1,671.97
Essex-Hamilton County line, ⅞ mile west of; copper plug in bowlder 12 feet left of and 3.5 feet above center of road, marked "U.S.G.S. 1698 Ft. B.M."	1,693.058
Indian River Bridge, west abutment; square chisel mark near front angle of coping on upstream end	1,596.61
Main road, ½ mile from; outcrop 40 feet to right of road near small bush surrounded by stones; square chisel mark on southeast end	1,607.72
Main road, 1¼ miles from; square chisel mark on bowlder 6 feet to right of and 15 feet north of blazed birch tree	1,623.67
Main road, 1½ miles from; square chisel mark on northerly of two bowlders 10 feet to right of road	1,610,82
Main road, 1⅝ miles from; square chisel mark on outcrop 5 feet to left of road	1,642.22
Main road, 1⅞ miles from; square chisel mark on bowlder 5 feet to left of and 6 feet northeast of blazed maple tree	1,621.49
Main road, 2¼ miles from; square chisel mark on outcrop 6.5 feet to right of and 3 feet above center of road	1,645.23
Main road, 2¾ miles from; square chisel mark on slanting outcrop 6 feet to right of and 1.7 feet above center of road in small clearing	1,541.32
Main road, 3⅝ miles from; square chisel mark on north half of large split bowlder, 12.5 feet to left of and 8.4 feet above center of road	1,523.78
Hudson River, southwest bank, junction of with north bank of Indian River; circular chisel mark and letter "S" on large bowlder	1,423.15

MOUTH OF INDIAN RIVER TO CHAIN LAKES.

Gooley's boat-house, junction of trail from, with west bank of Hudson River; bowlder marked with chiseled circle and letter "V"	1,429.16

	Feet.
Gooley's, ¼ mile north of; square chisel mark on bowlder 9 feet to left of and 3.7 feet above center of road, 300 feet south of log barn on left of road	1, 536. 04
Gooley's, ⅜ mile beyond; square chisel mark on bowlder 5 feet to right of and 2.9 feet above center of road, 260 feet beyond blazed poplar tree, marked "A," on right of road	1, 569. 63
Gooley's, 1⅛ miles beyond; bowlder 5 feet to right of and 3.3 feet above center of road, 8 feet beyond stream, marked with chiseled circle and letter "C"	1, 603. 65
Gooley's, 1⅜ miles beyond; square chisel mark on bowlder 15 feet to left of and 0.6 feet above center of road, 10 feet southeast of small poplar tree and 12 feet west of south of small fir tree	1, 682. 15
Gooley's, 1¾ miles beyond; square chisel mark and letter "Y" on bowlder 12 feet to right of and 7.3 feet above center of road, at junction with road leading to Mud Pond	1, 645. 05
Cedar River, south bank of, 20 feet southwest of ferry on road to Chain Lakes; copper plug in outcrop marked "U.S.G.S. 1549 Ft. B.M."	1,543. 434
Cedar River, 1¼ miles beyond; square chisel mark on bowlder 9 feet to right of and 4 feet above center of road, 3 feet southwest of blazed maple tree, marked "D"	1, 563. 32
Cedar River, 1⅞ miles from; square chisel mark on bowlder 6 feet to right of and 2.6 feet above center of road, 7 feet southwest of blazed hemlock.	1, 713. 83
Chain Lakes, 3d of; copper plug in outcrop, 50 feet from and 12 feet above water surface, and 1,100 feet northwest of hotel	1, 609. 624

MOUTH OF INDIAN RIVER TO NORTH WOODS CLUB.

Hudson River, southwest bank, junction of, with northwest bank of Indian River; copper plug set in recess at upper southwest corner of bowlder, marked "U.S.G.S. 1428 Ft. B.M."	1, 422. 728
Indian River, ⅜ mile from mouth of; bowlder 3 feet to left of and 2.3 feet above center of path and 800 feet east of brook flowing west, marked with chiseled circle and letter "N"	1, 643. 23
Indian River, 1 mile from mouth of; square chisel mark on outcrop crossing path 6 feet southeast of blazed birch tree	1, 677. 50
Indian River, 1¼ miles from mouth of; square chisel mark and letter "A" on west end of bowlder, 12 feet to left of and 4 feet above center of path, 2 feet southeast of one and 6 feet west of a second blazed maple tree	1, 643. 69
Indian River, 1⅜ miles from mouth of; bowlder 8 feet to right of and 2.7 feet above center of path marked with chiseled circle, "A"	1, 636. 13
Indian River, 1½ miles from mouth of; on bowlder 5 feet to right of and 2.2 feet above center of path; mark, chiseled circle and "B"	1, 609. 90
Dunk Pond, outlet of; bowlder in center of path; mark, chiseled square.	1, 545. 19
Indian River, 2 miles from mouth of; bowlder 4 feet to left of and 1 foot above center of path; mark, chiseled circle and "O 3"	1, 616. 40
Indian River, 2⅜ miles from; square chisel mark on bowlder 1 foot to right of and 0.7 foot above center of path, 30 feet north of crossing of brook	1, 683. 35
Cedar Pond trail, junction of path with; bowlder 3 feet to left of and 1 foot above, marked with chiseled circle and "D 2"	1, 706. 43
Indian River, 2⅜ miles from mouth of; square chisel mark on southeast end of bowlder at brook, 15 feet to left of and 4 feet above center of path	1, 703. 84
Indian River, 2¾ miles from mouth of; bowlder 3 feet to left of and 1.8 feet above center of path, marked with chiseled circle and "E 1"	1, 738. 73
North Woods Clubhouse, ½ mile back from; bowlder at edge of clearing; mark, chiseled circle and "F 1"	1, 779. 07

NORTH WOODS CLUB TO MOOSE POND CLUB VIA NATE POND.

	Feet.
North Woods Clubhouse, bowlder 200 feet northeast of; copper plug marked "U.S.G.S. 1769 Ft. B.M."	1, 763. 656
North Woods Clubhouse, 200 feet northeast of; bowlder with copper plug described above, at point marked with chiseled circle and "G 1"	1, 763. 70
North Woods Clubhouse, ½ mile east of; bowlder 6 feet to left of and 0.8 foot above center of road at end of clearing; marked with chiseled circle and "H 1"	1, 812. 38
North Woods Clubhouse, ¾ mile east of; bowlder 8 feet to left of and 8 foot south of blazed birch tree	1, 734. 94
Mink Pond outlet, 450 feet southeast of bridge over; square chisel mark on bowlder 4 feet to left of and 1 foot above center of road	1, 700. 38
Mink Pond outlet, ¼ mile east of; bowlder 10 feet to left of and 1.8 feet above center of road; mark, a chiseled circle and "K 1"	1, 698. 53
Mink and Thumb ponds, junction of trail to, with carriage road; square chisel mark on bowlder 5 feet to left of and 1 foot above center of road, 12 feet southwest of blazed elm tree	1, 644. 53
North Woods Club road, ¼ mile from; square chisel mark on westernmost of two bowlders, 15 feet to right of and 1.8 feet above center of path, between two blazed birch trees	1, 701. 83
North Woods Club road, ½ mile beyond; square chisel mark on bowlder 12 feet to left of and 1 foot above center of path at top of rise 8 feet south of blazed spruce tree	1, 717. 68
Mink and Thumb ponds, 20 feet west of crossing of path between; bowlder 10 feet to right of and 4 feet above center of path	1, 685. 18
Thumb Pond, bowlder at edge of at foot of trail from Mink Pond, marked with chiseled circle and letters "F F"	1, 678. 54
North Woods Club road, 1¼ miles from; square chisel mark on east end of bowlder in center of and 1.3 feet above trail at junction with trail from right, 15 feet south of blazed birch tree	1, 712. 22
North Woods Club road, 1½ miles from; square chisel mark on bowlder in path 30 feet southwest of blazed spruce tree	1, 721. 98
Land line, 50 feet north of crossing of; square chisel mark on north end of bowlder 6 feet to left of and 4.2 feet above center of path	1, 782. 81
Land line, ¼ mile beyond; square chisel mark on point of bowlder in brook to left of and 0.2 foot below center of path, 20 feet northeast of blazed birch tree on right of path and 380 feet beyond old camp on left of path	1, 826. 61
North Woods Club road, 3 miles from; square chisel mark on bowlder in path 20 feet west of north of blazed maple tree on right of path	1, 955. 48
Nate Pond landing, north side of pond; square chisel mark on west end of flat-topped bowlder 15 feet southwest of pine tree bearing sign of Moose Pond Club	2, 011. 45
Nate Pond landing, ¼ mile beyond; bowlder 3 feet to right of and 1.3 feet above center of path, 7 feet east of south of blazed beech tree	2, 105. 94
Fish Pond, southwest shore of; square chisel mark on bowlder at water's edge, to right of path	2, 150. 91
Moose Pond Clubhouse, 100 feet northwest of; copper bolt in large bowlder, by shore, marked "U.S.G.S. 2095 Ft. B.M."	2, 090. 23

MOOSE POND CLUB TO AIDEN LAIR.

Moose Pond Clubhouse, ½ mile from; square chisel mark on bowlder 25 feet to right of and 2.7 feet below center of road, between two blazed birch trees	2, 068. 24
Moose Pond Clubhouse, 1 mile from; square chisel mark on bowlder 15 feet to left of and 5.7 feet above center of road, 6 feet west of blazed birch and 3 feet southeast of another blazed beech	1, 840. 38

	Feet.
Moose Pond Clubhouse, 2 miles from; at junction of carriage road and trail to Aiden Lair; square chisel mark on bowlder 3 feet to right of and 1.2 feet above road	1, 629. 76
Moose Pond Clubhouse, 2⅝ miles from; square chisel mark on bowlder surmounted by small blazed balsam, 3 feet to right of and 2.2 feet above center of path	1, 629. 07
Boreas River, ¼ mile from; bowlder in center and 0.4 feet above path, 6 feet southeast of blazed poplar tree	1, 631. 63
Boreas River, 800 feet back from; square chisel mark on large bowlder 10 feet to right of and 6.5 feet above center of path; bowlder is marked X on side	1, 571. 52
Boreas River, ⅜ mile east of; square chisel mark on bowlder 1.5 feet to left of and 1.2 feet above center of path	1, 616. 48
Aiden Lair and Newcomb road, square chisel mark on bowlder 30 feet west of south of center of road, 50 feet southeast of Loveland's barn	1, 640. 68

INDIAN LAKE TO CEDAR RIVER.

North River, 500 feet east of 14-mile post from; square chisel mark on bowlder 8 feet to left of and 2.5 feet above center of road, about 180 feet east of bridge over small stream, flowing north	1, 682. 48
Cedar River, iron bridge over; downstream end of west abutment, square chisel mark	1, 669. 47
North River, 185 feet south of west of 15-mile post from; square chisel mark on bowlder 70 feet to right of and 4.5 feet above center of road	1, 682. 78

CEDAR RIVER HOUSE TO WAKELEY DAM.

Main road, ¾ mile from; square chisel mark on bowlder 20 feet to right of and 1.7 feet above center of road, 275 feet back from small stream	1, 693. 77
Main road, 1¾ miles from; square chisel mark on bowlder 6 feet to left of and 4.7 feet above center of road	1, 743. 11
Main road, 3 miles from; square chisel mark on bowlder 30 feet to right of and 2.6 feet above center of road, 365 feet back from log house on left of road	1, 772. 63
Main road, 3⅞ miles from; square chisel mark on outcrop 8 feet to right of and 1.6 feet above center of road, 210 feet back from summit	1, 912. 28
Main road, 5¼ miles from; square chisel mark on large bowlder 28 feet to left of and 5.8 feet above center of road, 500 feet back from white frame schoolhouse on right of road	1, 866. 02
Potter's house, ¾ mile beyond; square chisel mark on bowlder 21 feet to left of and 2.9 feet above center of road, 200 feet north of east of partly log and partly frame house on left of road	1, 875. 67
Brown's house, ¾ mile beyond and 7⅝ miles from main road; copper plug set in bowlder 15 feet to right of and 5.3 feet above center of road, 20 feet north of bridge over small stream flowing to left, marked "U.S.G.S. B.M. 1918"	1, 912. 613
Brown's house, 1⅛ miles beyond; square chisel mark on bowlder 5 feet to left of and 2.8 feet above center of road, 300 feet beyond summit	1, 959. 70
Brown's house, 1⅞ miles beyond; square chisel mark on bowlder 7 feet to right of and 3.5 feet above center of road, 50 feet northeast of pole bridge over brook flowing to left	2, 032. 35
Brown's house, 2⅞ miles beyond; square chisel mark on bowlder 7 feet to right of and 3.9 feet above center of road, 7 feet southeast of blazed beech tree	2, 083. 98
Wakeley Pond outlet, 12 feet beyond bridge over; square chisel mark on bowlder 4 feet to right of and 1 foot above center of road	2, 092. 85
Wakeley Dam; copper plug in bowlder 25 feet east of north of log house at, marked "U.S.G.S. 2124 Ft. B.M."	2, 118. 804

CEDAR RIVER HOUSE TO FOREST HOUSE.

	Feet.
Fifteen-mile post, ⅘ mile beyond; bowlder 7 feet to right of and 1.8 feet above center of road, square chisel mark	1,750.17
Sixteen-mile post, ½ mile beyond; bowlder 8 feet to left of and 0.4 feet above center of road, square chisel mark	1,802.96
Seventeen-mile post, ¼ mile beyond; square chisel mark on outcrop 8 feet to left of and 1.4 feet above center of road	1,921.43
Seventeen mile post, ⅞ mile beyond; square chisel mark on bowlder 14 feet to left of and 3.6 feet above center of road	1,894.62
Eighteen-mile post, ½ mile beyond; square chisel mark on bowlder 9 feet to right of and 3.8 feet above center of road	1,891.67
Eighteen-mile post, 1 mile beyond; square chisel mark on bowlder 7 feet to left of and 2.8 feet above center of road, 190 feet back from brook flowing to right	1,772.95
Forest House, 19¾ miles from North River; copper plug in outcrop 25 feet to north of west of northwest corner of barroom; marked "U.S.G.S. 1941 Ft. B.M."	1,936.285

FOREST HOUSE TO BLUE MOUNTAIN LAKE.

Denmark's house, 300 feet southeast of; 20⅝ miles from North River; square chisel mark on bowlder 16 feet to right of and 3.4 feet above center of road	1,874.73
North River, 21½ miles from; square chisel mark on bowlder 7 feet to right of and 0.9 foot above center of road	1,774.28
Rock River, bridge over, 21⅝ miles from North River; square chisel mark on downstream end of easterly abutment	1,773.61
North River, 23¾ miles from; square chisel mark on large bowlder 12 feet to left of and 2.4 feet above center of road, at point of crossing of swamp	1,772.28
Blue Mountain Lake House, ⅞ mile back from; square chisel mark in recess, westerly end of large bowlder 7 feet to right of and 2.6 feet above center of road at point 125 feet southeast of junction of main road and road leading to Prospect House	1,785.99

BLUE MOUNTAIN LAKE TO LONG LAKE.

Blue Mountain Lake, foundation of new schoolhouse; cross in copper tablet set in second stone from southwest corner of second course from top, marked "1810"	1,804.76
Blue Mountain Lake schoolhouse, ⅘ mile beyond; square chisel mark on bowlder 7 feet to left of and 3 feet above center of road, 65 feet back from watering trough on right	1,939.05
Blue Mountain Lake schoolhouse, 1⅛ miles from; square chisel mark on bowlder 15 feet to right of and 0.3 foot above center of road, opposite Duprez's house	2,162.96
Blue Mountain Lake schoolhouse, 1⅝ miles from; square chisel mark on bowlder 6 feet to left of and 1.5 feet above center of road, 75 feet beyond small stream flowing to left	2,072.72
Blue Mountain Lake schoolhouse, 2¼ miles from; square chisel mark on bowlder 8 feet to right of and 1.9 feet above center of road about 850 feet beyond brook flowing to left	2,071.66
Bennett's house, ⅘ mile beyond; square chisel mark on bowlder 8 feet to left of and 1 foot above center of road	1,945.96
Salmon River, ⅛ mile beyond; square chisel mark on bowlder 6 feet to right of and 2.8 feet above center of road	1,821.09
Salmon River, ¾ mile beyond; square chisel mark on bowlder 8 feet to left of and 2.1 feet above center of road, 515 feet beyond small stream flowing to left and 138 paces back from 6-mile post	1,797.36

	Feet.
Long Lake, 5¼ miles from; copper plug in bowlder 12 feet to left of and 2.1 feet above center of road, marked "U.S.G.S. 1855 Ft. B.M."	1, 850. 247
Long Lake, 4¾ miles from; square chisel mark on bowlder 11 feet to left of center of road, 35 feet beyond brook flowing to left	1, 781. 59
Long Lake, 4¼ miles from; square chisel mark on outcrop 6 feet to left of and 0.4 foot above center of road, 75 feet back from ledge on left	1, 818. 34
Long Lake, 3½ miles from; square chisel mark on large bowlder near fence, 500 feet east of South Grove House	1,671. 21
Three-mile post, 410 feet beyond; square chisel mark on projecting stone at northerly corner of foundation of red-roofed frame house on right of road	1, 727. 43
Long Lake, 1⅞ miles from; square chisel mark on outcrop, 7 feet to right of and 2.2 feet above center of road, 100 feet beyond log house on right	1, 670. 58
Long Lake, 1¼ miles from; square chisel mark on bowlder 8 feet to left of and 0.7 foot above center of road, 325 feet beyond brook flowing to left	1, 663. 62
Long Lake, 260 feet west of Sabattis's two-storied frame house; copper plug, set in west end of outcrop, 130 feet to left of center of road, marked "U.S.G.S. 1663 Ft. B.M."	1, 657. 769

LONG LAKE TO HAMILTON—ESSEX COUNTY LINE.

Long Lake, ¼ mile east of; square chisel mark on bowlder 11 feet to left of and 7 feet above center of road, 100 feet northeast of Shaw's sawmill	1, 739. 10
Long Lake, 1¼ miles east of; square chisel mark on bowlder 30 feet to left of and 6 feet above center of road, 125 feet south of east of schoolhouse.	1, 780. 03
Long Lake, 2⅛ miles east of; square chisel mark on bowlder 10 feet to right of and 3.7 feet above center of road, 25 feet beyond plank culvert	1, 861. 22
Long Lake, 2⅞ miles from; square chisel mark on bowlder 8 feet to right of and 3 feet above center of road, 125 feet beyond pole culvert over drain	1, 860. 53
Long Lake, 3⅝ miles east of; square chisel mark and letter "A" on bowlder 12 feet to left of and 2.1 feet above center of road	1, 874. 58
Four-mile post, 35 feet back from; copper plug set in outcrop 14 feet to right of and 2.5 feet above center of road, marked "U.S.G.S. 1863 Ft. B.M."	1, 857. 549
Long Lake, 4⅝ miles from; square chisel mark on bowlder 6 feet to right of and 1.7 feet above center of road	1, 794. 47
Long Lake, 5¼ miles east of; square chisel mark on bowlder 22 feet to left of and 1.7 feet below center of road, 275 feet beyond small brook flowing to left	1, 840. 08
Six-mile post, 65 feet east of; square chisel mark on bowlder 6 feet to right of and 0.9 foot above center of road	1, 837. 89
Seven-mile post, 200 feet east of; square chisel mark on bowlder 18 feet to left of and 12 feet above center of road	1, 782. 74
Long Lake, 7⅝ miles east of; square chisel mark on bowlder 6 feet to right of and 2.8 feet above center of road, 685 feet east of culvert over small stream flowing to left	1, 749. 72

INDIAN RIVER TO UNITED STATES GEOLOGICAL SURVEY COPPER BOLT BENCH MARK SOUTH OF VILLAGE OF INDIAN LAKE.

Indian River Bridge, west abutment, upstream end near front angle of coping; square chisel mark	1, 596. 61
North River, 12¼ miles from; square chisel mark on west end of quartz outcrop 12 feet to right of road, 75 feet east of brook	1, 638. 73

	Feet.
Indian Lake village; square chisel mark on long bowlder 10 feet to right of road, 250 feet west of top of hill and 10 feet from fifth tree in row north of road, counting from east	1,728.81
Indian Lake village, ½ mile from on road to Indian Lake (Sabael post-office); west end of smooth, sloping outcrop 75 feet in length, 10 feet from road and 20 feet east of elm tree 8 inches in diameter; copper bolt marked "U.S.G.S. 1793 Ft. B.M."	1,787.638

ONEIDA AND HERKIMER COUNTIES.

UTICA QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the masonry wall of the United States post-office building in Utica, marked "U. S. Geological Survey. Elevation 419 feet. B. M." The elevation of this bench mark above mean sea level is obtained from the nearest permanent bench mark of the State canals. As reduced in accordance with the latest information, the height of this bench mark is 417.516 feet. The leveling was done by Mr. A. B. Pomme, levelman, under the direction of Mr. J. H. Jennings, topographer.

UTICA

	Feet.
Whitesboro and Genesee streets, southwest corner; top of westerly cap bolt on hydrant	415.69
Delaware, Lackawanna and Western Railroad station; top of doorsill, southeast corner of corner door	409.49
North Genesee street, No. 218; water table, southwest corner of brick building	410.30
Post-office; bronze tablet west of east basement door, rear of building, marked "U. S. Geological Survey B.M. Elevation 419 feet"	417.516
Webster avenue and Albany street; top of most southerly cap bolt on hydrant	495.49
Albany and Elizabeth streets; top of southerly cap bolt of hydrant	462.80
Albany and Bacon streets; top of most southerly cap bolt of hydrant	546.22
Albany street and Tilden avenue; top of hydrant (city bench mark, 548.03)	548.41
Albany street and Welsh Bush road; electric-light tower, top of second step from bottom	525.68
Albany street, Starch Factory Creek; stone arch bridge, north abutment, west wing, on northeast corner of top step	523.40
Delaware, Lackawanna and Western, and Rome, Watertown and Ogdensburg railroads; northwest corner of foundation of northwest pier (New York Central and Hudson River Railroad elevation, 406.964)	409.10
New York Central and Hudson River Railroad bridge No. 501, at Starch Factory Creek; south end of coping, west abutment (railroad elevation, 404.477)	406.66
North Genesee street; top of south end of west rail, Deerfield street-car track	410.25

UTICA, VIA ALBANY PLANK ROAD, TO FRANKFORT HILL AND STEWARTS CORNERS.

Albany plank road, Herkimer and Oneida county-line monument, marked on north side "1889," on east side "H," and on west side "O," the south side being blank; arrow and drill hole on top	695.17
Albany plank road, James McLaughlin's house; top of hitching post in front of	824.94

	Feet.
Albany plank road, road forks east and southeast; highest point on capstone at west side of upper end of culvert	886.78
Albany plank road, on road southeast; nail in wild-apple tree 75 feet south of culvert	889.64
Albany plank road, Joseph Cooper's house (occupied by Mr. Easterman); nail in east side of wild-cherry tree on east side of road, north of house, near fence	991.95
Albany plank road, crossing of Marsh road; highest point on southeast corner of capstone of culvert northeast from schoolhouse	984.10
Albany plank road, road west; nail in root of black-ash tree, below blaze with three hacks, east side of road	1,288.89
Frankfort Hill post-office; southeast corner of piazza, opposite road east	1,332.10
Stewarts Corners, church; northwest corner of top step at front entrance, 2 inches from building	1,351.51

STEWARTS CORNERS, VIA MOYER CREEK, TO FRANKFORT.

Rushmer road; copper bolt in bowlder east of first barn east of Stewarts Corners, between third and fourth telegraph poles east of barn, Nos. 9588 and 9587. Bowlder lies half in road and half in field, and copper bolt is marked "U.S.G.S. 1,380 feet. B.M."	1,378.914
Rushmer road; cross mark chiseled in corner stone of stone fence, westernmost corner of road coming in from the south	1,268.49
Rushmer road, northeast corner of road to north; nail in root of large hard-maple tree	1,182.89
Brick schoolhouse, district No. 8; square chisel mark northwest corner of doorsill	1,092.55
Moyer Creek road, John Bouck's house, 600 feet east of; square chisel mark and letters "B.M." on bowlder on north side of driveway of road	1,069.91
Moyer Creek Gulf road; square chisel mark on top of bowlder with "M" chiseled on south side, near east side of road on side hill, near two small blazed butternuts and 50 feet north of large blazed butternut with three hacks	997.96
Moyer Creek Gulf road; bent nail east end of south sleeper of highway bridge north of road forks	909.24
Moyer Creek Gulf road, Charles Denslow's house; nail in root of blazed and hacked elm tree opposite	856.27
Moyer Creek Gulf road, intersection of road west; square chisel mark on south abutment of bridge, west wing	634.50
Moyer Creek Wooden Bridge; nail in root of blazed butternut tree, east side of road near old barn and abandoned house, 200 feet north of bridge.	578.73
Moyer Creek Iron Bridge; square chisel mark on coping of bridge seat, north abutment, east wing	500.71
Frankfort, N. Y.; square chisel mark southeast corner of limestone carriage step in front of house on Litchfield street opposite Fourth avenue.	433.05

DEERFIELD VIA TRENTON PLANK ROAD TO SOUTH TRENTON.

Deerfield, J. A. Auerts' brick building, middle door; north corner of stone doorsill	427.87
Trenton plank road; top of stone south of culvert, at intersection of Walker road, 10.2 feet south of telephone pole	431.77
Trenton plank road; nail southwest side of telephone pole at intersection of Walker road, 102 feet north of above stone	432.20
Trenton plank road; willow tree east side of road and 180 feet from foot of hill, blazed with three hacks, nail in notch 1 foot above ground	462.32
Trenton plank road; blazed telephone pole on top of rise, east side of road and south from drab-colored house, top of nail	531.35

	Feet.
Trenton Falls plank road, at intersection of road running north; top of nail in notch cut in blazed willow tree; two other willows just west of bench mark	617.63
Trenton plank road, opposite intersection of Glass Factory or Holland Patent road; nail in top of chopped down, blazed, and marked telephone pole, 1.5 feet south of blazed and marked telephone pole	708.00
Trenton plank road, white house opposite road east; bent nail in root of maple tree north of carriage step	790.03
Trenton plank road, intersection of Church road; square chisel mark on stone at south corner 2 feet east of blazed and marked corner fence post.	809.99
Trenton plank road, Salem Welsh church on road west 600 feet from plank road; square chisel mark on foundation stone at southeast corner	816.10
Trenton plank road, South Trenton cemetery; bent nail in root south side of beech tree opposite middle gate	804.00
South Trenton; copper bolt in bowlder north side of road opposite west gate of cemetery, marked "U.S.G.S. B.M. 806 ft."	804.368

SOUTH TRENTON TO TRENTON RAILROAD STATION.

South Trenton, road crossing ½ mile north of; square chisel mark on stone northwest corner of driveway	835.90
South Trenton, 1½ miles north of, intersection of Trenton plank road and Holland Patent road, stone in northwest corner; square chisel mark	810.69
Birdseye's, William, house, opposite Fair Grounds, top of limestone hitching post, east side of road	795.34
Rome, Watertown and Ogdensburg Railroad crossing, 1,500 feet south of, at intersection of road running east; shoulder of bottom cornerstone of stone fence in northeast corner. A cross is cut in the face of the stone just under the shoulder	803.00
Trenton railroad station; water table 0.42 feet west of south door of waiting room	841.12
Trenton plank road, square chisel mark on stone over fence, back of telephone pole with bulletin board, opposite road to northwest	853.91
Trenton plank road, square chisel mark, southwest corner of capstone, south side of culvert over little brook at head of gully	1,019.28
Trenton plank road, road crossing; square chisel mark on bowlder in northwest corner, 3 feet east of blazed and marked corner fence post	1,212.02
Trenton plank road, square chisel mark on bowlder east side of road, 350 feet north of edge of woods and 250 feet south of first culvert in woods.	1,162.78
Trenton plank road, opposite road to northeast; square chisel mark on bowlder west side of road	1,180.30
Trenton plank road, 500 feet south of T. H. Williams's, west side of road; square chisel mark on bowlder north of small iron bridge and opposite farm road to northeast	1,001.27
Forest House; square chisel mark on bowlder north of barn, opposite hotel.	935.06
Trenton plank road, west side of road along telephone line; square chisel mark on bowlder opposite road from Forest House	900.91
Trenton plank road, Budwin Jones's house; top of limestone hitching post in front of	840.30
Trenton plank road, Ninemile Creek bridge; square chisel mark on west bridge seat, north abutment	756.22
Trenton plank road, South Trenton church, opposite schoolhouse, southeast corner of carriage step; square chisel mark	807.48

SOUTH TRENTON TO NORTH GAGE.

North Gage road, square chisel mark on stone north side of road, opposite road running south	823.46

	Feet.
North Gage road, intersection of South Trenton road, northwest corner of road crossing; square chisel mark on bowlder	901.71
North Gage road, road north (almost abandoned); square chisel mark on bowlder inside of fence, northeast corner	972.14
North Gage, M. M. Schermerhorn's house; top of easterly limestone hitching post	966.23
North Gage church; square chisel mark on southeast corner of stone step.	986.37

NORTH GAGE TO POLAND.

North Gage, east of first road running north; bent nail in root of hard maple tree in southwest corner of road crossing	945.76
North Gage road, road north to Poland at cheese factory; square chisel mark on stone in northeast corner	915.72
Hill road, intersection with Valley road, 300 feet east of covered wooden bridge over West Canada Creek, 1½ miles above Poland; nail in root of apple tree in southwest corner of road crossing	720.13
West Canada Creek bridge, 1½ miles above Poland; square chisel mark on south abutment bridge seat, east wing of bridge	707.03
West Canada Creek, iron bridge, ½ mile west of Poland; square chisel mark on west abutment, north wing	698.19
Poland, Main street; square chisel mark on west coping, center of stone arch over Cold Brook	720.70
Poland Free Baptist church; stepping stone, square chisel mark in southeast corner	716.12
Poland, railroad depot; spike in telegraph pole opposite. (This is R. R. B. M. Elevation above sea, as given by R. R., is 706.752 = 703.849 N. Y. C & H. R. R. R.)	707.87

POLAND TO COLD BROOK.

Chas. Buck's house opposite road to village of Cold Brook, southeast corner of piazza	788.50
Copper plug in foundation stone, east abutment north wing of first small iron bridge over Cold Brook above (northeast of) Poland, marked "U.S.G.S.B.M. 800 ft."	799.147

POLAND TO NEWPORT.

Poland, ½ mile south of; square chisel mark on east abutment bridge seat, north wing iron bridge (highway) over West Canada Creek	691.17
Square chisel mark on bridge seat, south abutment, east wing of bridge over small brook, north of and near forks to hill road running southeast.	683.58
Square chisel mark on stone east side of road south of house (old glue factory) owned by Milo Morey; fence post blazed	682.95
Newport, Main and Norway streets, top of snubbing stone in northeast corner of crossing, square chisel mark	681.50
Newport National Bank, water table northeast corner of building	657.84
Newport, stone bridge over West Canada Creek; square chisel mark on north coping over center pier	656.70
Newport, copper plug set in north coping over center pier of stone bridge over West Canada Creek, 6 inches south of square chisel mark and flush with coping, marked "U.S.G.S. 658 ft. B.M."	656.70

NEWPORT TO MIDDLEVILLE.

White Creek iron bridge; square chisel mark on south abutment bridge seat, east wing	633.01
City Brook; square chisel mark on coping stone on south end of east parapet wall of stone arch	609.26

	Feet.
Square chisel mark on sandstone bowlder on west side of road and north of barn at intersection of Creek road and road from north, opposite A. G. Smith's house	608.20
Canon Brook, stone arch over; square chisel mark on coping stone, south end of east parapet wall	591.70
Middleville, Main and Bridge streets; square chisel mark on northwest corner of stone porch of H. E. & D. G. Jackson's store	584.15
Middleville, West Canada Creek; north coping of west abutment of iron bridge, marked "⊙ B.M. 21."	572.51
Middleville, West Canada Creek; copper bolt in coping of iron bridge, west abutment, north wing, marked "U.S.G.S. B.M. 572."	571.02
Middleville; head of spike in third telegraph pole north of bridge across mill race at dam on west side of creek	374.60

MIDDLEVILLE TO HERKIMER.

Middleville, one mile south of; square chisel mark on capstone of culvert on west side of road, south of road west	552.70
Herkimer County Poorhouse; square chisel mark in north corner of bottom flagstone, front entrance	591.36
Countrymans station, ¼ mile north of; square chisel mark on capstone of culvert on west side of road, south of road west	549.92
Countrymans station, Atlantic and St. Lawrence (Grand Trunk) Railroad, bridge No. 10; square chisel mark on coping stone of north abutment, west wing wall, close to angle	492.46
West Canada Creek, Dempster's bridge, ½ mile north of Kast's bridge; bridge seat, north abutment, west wing, marked "⊙ B.M."	473.95
West Canada Creek, Kast's Bridge (railroad station); bridge seat, west abutment, north wing, marked "⊙ B.M."	457.65
Kast's Bridge, ½ mile south of; square chisel mark on stone west of intersection of Creek road with road running northwest up steep hill	453.68
Herkimer, German and Lake streets; square chisel mark on stone projecting out of wall, west abutment, south wing of flood bridge	402.52
Herkimer waterworks, pump house; northwest corner of doorstep, north door, marked "⊙ B.M. 5"	402.18
Herkimer, Albany and Washington streets; top of corner fence post in southwest corner	401.31
Herkimer, Albany and Main streets; water-table southeast corner of Manion and Fick's building	395.22
Mohawk, closing bench on circuit Utica, South Trenton, North Gage, Poland, Newport, Middleville, Herkimer, and Mohawk; Erie Canal Lock No. 42, coping at end of anchor, northeast gate, north lock, marked "⊕ B.M."	397.421

ILION.

Steele Creek Aqueduct, Erie Canal; copper bolt in center of third coping stone from west end, parapet wall, towpath side, marked "U.S.G.S. B.M. 410 ft."	408.964
West Canal street, west end; top of cap, east nozzle of hydrant	403.33
East Main street; top of cap east nozzle of first hydrant east of East street, in front of greenhouse	410.06

FRANKFORT TO COPPER PLUG NORTH OF FRANKFORT, IN TOWN OF SCHUYLER.

Frankfort; most northerly cap bolt on four-nozzle hydrant in front of Central Hotel	414.86
West Shore Railroad crossing; top of south rail	400.85

	Feet.
Mohawk River bridge, near Frankfort depot; square chisel mark on bridge seat, north abutment, east wing	399.04
New York Central Railroad crossing; top of south rail	400.43
Nail in root, northeast side of second maple tree on south side of road and west of road from north with B. & B. telephone line	411.03
Snubbing stone southeast corner of road at crossing of road running south with B. & B. telephone line, square chisel mark	410.05
Square chisel mark on stone back of corner fence post opposite road to East Schuyler church	418.84
Nail on top of corner fence post in northwest corner of road north	410.19
Square chisel mark on south side of millstone used as carriage step in front of white house opposite road from south	475.07
Copper plug in bowlder southwest corner of road crossing, road from south, marked "U.S.G.S. B.M. 580 ft."	579.248
United States Geological Survey iron bench-mark post at southwest corner of road crossing road forks, marked "U.S.G.S. B.M. 580 ft."	578.265

CAYUGA AND ONONDAGA COUNTIES.

AUBURN, SKANEATELES, AND MORAVIA QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the wall of the United States post-office building at Auburn, which is marked "U. S. Geological Survey. Elevation 710 feet. B. M." The elevation of this bench mark above mean sea level is derived from the nearest bench mark of the State canals. As reduced in accordance with the latest information, the height of this bench mark is 707.941 feet. The leveling was done chiefly by Mr. A. B. Pomme, levelman, under the general direction of Mr. J. H. Jennings, topographer.

CASCADE TO SCIPIO.

	Feet.
Cascade Hotel, 2 miles west of; square chisel mark on capstone of culvert in southeast corner of intersection of road running south	1,266.97
Cascade Hotel, 3 miles west of; square chisel mark and figures "1351" on stone under horse-chestnut tree in northeast corner of intersection of road running north and south	1,349.03
Cascade Hotel, 3½ miles west of; square chisel mark and figures "1306" on stone in northeast corner of intersection of road running north and south	1,303.99
Scipio, ¾ mile east of; square chisel mark and figures "1310" on stone in southeast corner of road running east and west	1,308.02
Scipio, square chisel mark and figures "1204" on stone on south side of road, about 25 feet west of west line of public school grounds	1,202.03
Scipio public school, 30 feet southeast of corner of; copper bolt in bowlder, marked "U.S.G.S. B.M. 1205 ft."	1,203.554

SCIPIO TO BARBERS.

Scipio, ½ mile west of; stone beside telegraph pole, north side of road, opposite large willow tree	1,110.10
Scipio, 1½ miles west of; square chisel mark and figures "1057" on stone in northwest corner of intersection of road running north and south	1,055.00
Scipio, 2 miles west of; square chisel mark and figures "1043" on stone in northeast corner of intersection of road running north and south	1,040.80

	Feet.
Scipioville, Watkin's store; square chisel mark on northeast corner of stepstone	989.64
Scipioville, ¼ mile west of; figues "974" on top of second limestone post east of road running north in front of cemetery	971.64
Barbers Corners, square chisel mark on mounting block in southeast corner of intersection of road running north and south	862.45
Barbers Corners, 250 feet south of; copper bolt in limestone bowlder on east side of road under apple tree near bridge, marked "U.S.G.S. B.M. 849 ft."	847.001

BARBERS TO LEVANNA.

Barbers Corners, 1½ miles west of; square chisel mark and figures "679" on stone in northeast corner of intersection of road running north	676.56
Levanna; square chisel mark and figures "426" on flagstone in southeast corner of intersection of road running north and south	423.58

LEVANNA TO AURORA.

Levanna, 1 mile south of; square chisel mark and figures "391" on southeast wing of railroad bridge 200 feet south of road running east	388.13
Aurora, northeast corner of water table of bank building north of hotel.	418.114
Aurora, Cayuga Military Academy; copper bolt in west end of doorsill, south door of basement, marked "U.S.G.S. B.M. 437 ft."	435.514

LEVANNA TO UNION SPRINGS.

Levanna, 1¼ miles north of; square chisel mark and figures "454" on stone near south end of culvert across road running east	450.74
Levanna, 2 miles north of; square chisel mark and figures "469" on bowlder in southeast corner of intersection of road running east	466 54
Farleys railroad station, ¼ mile east of; square chisel mark and figures "430" on stone in southwest corner of road to	426.79
Union Springs, ½ mile south of; square chisel mark and figures "433" on stone 30 feet south of southeast corner of intersection of road running east.	429.69
Union Springs, southwest corner of Main and Factory streets; top of ringbolt in marble hitching post of Murphy's store	419.22
Union Springs Sanitarium, basement door at south end of; copper bolt in west end of doorsill marked "U.S.G.S. B.M. 421 ft."	418.773

UNION SPRINGS TO AUBURN.

Union Springs, 1¼ miles north of; square chisel mark on bottom cornerstone of stone and picket fence, west side of road and opposite road to Auburn; also marked with figures "460"	456.49
Union Springs, 2½ miles northeast of; square chisel mark on south end of foundation stone of mounting block in southwest corner of intersection of road running north and south	586.62
Half Acre railroad station, 3½ miles southwest of; square chisel mark on southeast corner of mounting block in forks of road running north and road to Auburn	597.58
Half Acre railroad station, 3 miles southwest of; nail in root of white-ash tree opposite road to east	591 61
Half Acre railroad station, 2½ miles southwest of; square chisel mark and figures "611" on limestone bowlder in line with and opposite south fence of road to west	607.73
Springport, ½ mile south of; nail in root of tree marked 641 at intersection of road	637.52
Half Acre railroad station, 1¼ miles southwest of; square chisel mark and figures "710" on stone near southwest corner of intersection of road to south	706.769

	Feet.
Half Acre railroad station, ½ mile south of; square chisel mark and figures 677 on stone in northwest corner of intersection of road to north	673.53
Aurelius; square chisel mark and figures "648" on mounting block in southwest corner of four corners at	644.48
Aurelius, ¾ mile north of; square chisel mark and figures "627" on stone in northwest corner of intersection of road to Auburn	623.69
Aurelius, 1 mile east of; square chisel mark and "U.S.G.S. 655" on bowlder in southwest corner of intersection of road to south and railroad	652.30
Aurelius, 1¾ miles east of; square chisel mark on southeast bridge seat of bridge over Crane Brook	636.06
Auburn, Lehigh Valley Railroad bench mark; bolt in rock 411 feet south of south side of Genesee street on east side of track (railroad elevation, 647.083)	648.00
Auburn; city bench mark on west end of coping on south side of Genesee street between Sherwood and Delevan streets (elevation, 639.12)	643.40
Auburn, Genesee and Washington streets; square chisel mark on limestone bowlder at foot of fire-alarm pole in northeast corner of intersection of	733.82
Auburn; city bench mark on water-table northwest corner of court-house (elevation, 704.79)	709.04
Auburn Savings Bank building, corner Genesee and South streets; northeast corner of second step west corner entrance	690.29
Auburn, North and Market streets; city bench mark, top of monument near southwest corner of city hall lot (elevation, 667.91)	671.97
Auburn, Genesee and Seward streets; north nozzle-cap of hydrant	768.20
Auburn post-office building, Genesee street entrance; bronze tablet in top of wing stone at east end of steps marked "U.S. Geological Survey B.M. Elevation, 710 feet"	707.941

UNION SPRINGS TO CAYUGA.

Union Springs, 2 miles north of; square chisel mark and figures "443" on stone at foot of telephone pole in northwest corner of intersection of road to west	439.54
Union Springs, 3 miles north of; square chisel mark and figures "430" on stone under maple tree in northeast corner of intersection of road running east and west	427.19
Cayuga, 2 miles south of; square chisel mark and figures "439" on west end of stone in bank south of New York Central Railroad 4 feet east of cattle-guard fence, west side of road	435.81
Cayuga; square chisel mark and figures "424" on east flagstone in northeast corner of intersection of road to east	421.30
Cayuga; square chisel mark on northwest corner of doorsill to north door of malt house	388.06
Cayuga, Cayuga and Seneca Canal, Lock No. 10; copper bolt between anchors of west wing of south gate marked "U.S.G.S. B.M. 392 ft."	390.666

AUBURN TO FLEMING AND SCIPIO.

Auburn, Genesee street, 2 miles south of on Lehigh Valley Railroad; iron bolt in box culvert 911 feet north of north side of public road (elevation 720.440)	721.36
Auburn, 3 miles south of; square chisel mark on north end of stone culvert east of intersection of road to south	729.90
Fleming, 1½ miles north of; square chisel mark and figures "765" on stone at east end of culvert north of road to east	761.83
Fleming, 1¼ miles north of; square chisel mark and figures "779" on capstone south end of culvert across road to east	775.51

	Feet.
Fleming, ½ mile north of; square chisel mark on east side of stone in grassplot at intersection of road to west	873.96
Fleming, Methodist Episcopal Church; copper bolt in doorstep or watertable, south door marked "U.S.G.S. B.M. 912 ft."	910.329
Fleming, 1 mile south of; square chisel mark on bowlder on east of road about 4 feet from locust tree a little south of a brick house on west of road	921.00
Fleming, 2 miles south of; square chisel mark on whitewashed stone horse block, in front of wood-colored house west of road	959.54
Scipio, 3 miles north of; square chisel mark on rough stone horse block in front of white house on southwest corner of road intersection	1,070.75
Scipio, 2 miles north of; square chisel mark on bowlder on east side of road in front of white house in front of which is a walnut tree	1,196.18
Scipio, 1 mile north of; square chisel mark on bowlder near fence line on west side of road, about 600 feet south of summit	1,247.30

AUBURN TO SKANEATELES.

Auburn, 1½ miles east of; square chisel mark and figures "841" on bowlder in southeast corner of intersection of road south	838.97
Auburn, 3 miles east of; square chisel mark and figures "881" on capstone at west end of culvert across road to south	879.52
Auburn, 3½ miles east of; square chisel mark and figures "952" on bowlder at telephone pole west of intersection of road to south	950.36
Auburn, 4 miles east of; figures "921" on bowlder at telephone pole in northwest corner of intersection of road to north	918.70

THROOPSVILLE TO CAYUGA.

Throopsville, 1¾ miles east of; Lehigh Valley Railroad bench mark on iron bolt in stone foundation of culvert 201 feet north of point of switch (elevation 545.368)	546.281
Throopsville; grindstone used as horse block in front of small yellow house near corner 1,000 feet east of mill	531.43
Throopsville, Owasco outlet near gristmill; floor of bridge across	493.18
Throopsville; square chisel mark on southeast corner of stone horse block north side of road just east of four corners	516.59
Throopsville, ½ mile west of; top stone of culvert under north end of highway east of road to north	521.99
Throopsville, 1¾ miles west of; square chisel mark on rock west side of road near red barn ⅜ mile west of brick schoolhouse	536.55
Throopsville, 2 miles west of; floor of iron bridge across Crane Brook	485.05
Fosterville, 1 mile east of; square chisel mark on stone foundation of small wooden bridge, south end	508.41
Fosterville, ¾ mile east of; iron peg opposite telephone pole No. 13092	563.56
Fosterville, ½ mile east of; highest point of granite bowlder near south fence 60 feet west of well near road to north	520.13
Fosterville, 1 mile west of; floor of iron bridge near road to north	489.71
Fosterville, 1¾ miles west of; southeast corner of north wall of stone culvert about 500 feet east of road to north	485.51
Fosterville, 3 miles west of; square chisel mark on granite bowlder horse block in front of wood-colored house, south side of road, 800 feet east of canal	409.09
Cayuga, 1¾ miles north of; nail in stub of small blazed elm tree west of towpath of Cayuga canal and north of second telephone pole north of road to Fosterville	390.02

SKANEATELES.

	Feet.
Lake shore; projecting stone in retaining wall west of steamboat landing, marked "1843"	864.66
State dam, outlet of lake; crest at east end of dam	866.67
Syracuse Water Works Inlet; southwest corner of doorsill, front entrance of gatehouse	873.25
State dam; copper bolt in first step from top, west wing wall, marked "U.S.G.S. B.M. 870 ft."	868.084
Genesee and Onondaga streets; northerly cap bolt of hydrant	926.94
Genesee and East Lake streets; upper rim of south nozzle cap of hydrant.	981.08

SKANEATELES TO GLEN HAVEN, ROUTE ON WEST SIDE OF LAKE.

Skaneateles, 1½ miles west of; stone culvert, square chisel mark on east coping stone, north parapet	984.18
Auburn, 5½-mile post from; road crossing north from; square chisel mark on stone in southeast corner	997.85
Auburn road and road to Baptist Four Corners, culvert 215 feet south of intersection; square chisel mark on coping of west parapet wall	976.50
Baptist Four Corners, 1¾ miles north of; square chisel mark on capstone west end of culvert north side of road crossing	1,017.57
Baptist Four Corners, 1 mile north of; square chisel mark on bowlder on west side of road, 12 feet south of hedge and wire fence corner, a little south of house surrounded by evergreen and apple trees on east side of road	1,042.82
Baptist Four Corners, south of Baptist church sheds; nail in notch cut in root of ash tree	1,018.10
Baptist Four Corners; square chisel mark on snubbing stone in southeast corner of crossing of road leading to church	1,007.18
Baptist Four Corners, 1½ miles south of; square chisel mark on stone east side of road, west side of locust tree and outside of fence, about 50 feet north of intersection of road from west	934.97
Baptist Four Corners, 2 miles south of; square chisel mark on east keystone of road culvert about 100 feet north of road from west	878.97
Owasco, brook north of; square chisel mark on northwest seat of iron bridge	793.82
Owasco, snubbing stone north side of road and about 100 feet east of four corners	892.93
Owasco, bridge ½ mile southeast of; top of southeast corner post of railing.	857.41
Owasco, ½ mile southeast of, on road to "Twelve Corners;" copper bolt in fifth foundation stone from south end of dry wall on east side of north approach to small iron bridge, marked "U.S.G.S. B.M. 853 ft."	851.018
Owasco, 1 mile from; square chisel mark on stone east side of road running north and south and opposite road from	963.51
Owasco, 1½ miles from; square chisel mark on stone east side of road, on line with north fence of road from east; an Italian poplar in southeast corner of intersection of the two roads	1,063.07
Owasco, 2 miles from; square chisel mark on north wing stone, southwest end of culvert at forks of road	1,177.34
Owasco, 2¾ miles from; square chisel mark on stone west side of road opposite road from east	1,277.77
Owasco, 3 miles from; iron bridge over small brook at intersection of road from the west, square chisel mark on northeast bridge seat	1,235.00
"Twelve Corners," crossroads at schoolhouse; square chisel mark on stone at west end of culvert	1,375.26
"Twelve Corners," house in northeast corner of road crossing; square chisel mark on bowlder in front yard	1,393.37

	Feet.
"Twelve Corners," on first hill south of; stone in fence, west side of road, about 100 feet north of gate and north of blazed fence post	1, 464. 46
"Twelve Corners," 1¼ miles southeast from; square chisel mark on bowlder east of east fence of road and 25 feet north of the north line of road coming in from the west	1, 449. 32
"Twelve Corners" to Kelloggsville, intersection of road with Valley road running north and south; square chisel mark on capstone at west end of culvert	1, 172. 43
Kelloggsville, Main street and Hill road; snubbing stone in northwest corner of crossing	1, 422. 53
Kelloggsville, stone culvert over small brook north of intersection of Main street and Hill road; square chisel mark on coping stone near center of east parapet wall	1, 416. 60
Kelloggsville, opposite road from "Twelve Corners;" copper bolt in bowlder west side of maple tree and scales in front of W. D. Sayles's store, marked "U.S.G.S. B.M. 1424 ft"	1, 422. 617
Kelloggsville, 1 mile south of, opposite road running west; square chisel mark on north corner stone of gateway in stone fence	1, 545. 74
Kelloggsville, 1½ miles south of; square chisel mark on capstone at west end of culvert across road at north line of road running east	1, 567. 60
Sayles Corners; square chisel mark at south end of culvert across road from east	1, 588. 80
Sayles Corners, ½ mile southwest of; nail in trunk of small blazed and hacked locust tree on west side of road, opposite center of road running east	1, 444. 43
Wilsons Corners, top of retaining wall of approach to upper story of blacksmith shop; square chisel mark in limestone bowlder	1, 092. 70
Sayles Corners, ¾ mile southeast of; nail in east side of maple stump, northwest corner of intersection of road from the west	1, 556. 88
Sayles Corners, ¾ mile southeast of; square chisel mark on bottom corner stone of fence, southeast corner of intersection of road running south. A large ash tree stands near the southeast corner and a basswood in the southwest corner	1, 565. 37
Sayles Corners, 1 mile southeast of; square chisel mark on bowlder in northeast corner of crossing of road running east	1, 704. 38
Sayles Corners, 2 miles southeast of; square chisel mark on stone west of first fence post west of northwest corner post of intersection of road from the north	1, 754. 49
Bear Swamp, just west of; square chisel mark on stone on north side of grass plot between east and west fork of road from the south	1, 781. 78
Glen Haven, road running north and south to; square chisel mark on stone opposite road from Sayles Corners, just east of Bear Swamp	1, 573. 20
Glen Haven; square chisel mark on south corner stone of gateway in fence opposite road running east, 4 miles to	1, 663. 97
Glen Haven, 4 miles from, in abandoned road; square chisel mark on stone in most westerly wheel track, 50 feet southeast of traveled road running east and 15 feet east of twin apple tree west side of road	1, 668. 11
Glen Haven, 2 miles south of; nail in south root of blazed and hacked butternut tree on west side of road and 75 feet north of road from hill.	1, 272. 19
Skaneateles Lake, bridge over south inlet at intersection of roads southwest and north and south; square chisel mark on stone 3 feet east of southeast bridge seat	977. 65
Spafford, north line of road running east to; nail in north root of hard maple tree on west side of road opposite to	883. 43
Glen Haven, iron bridge at south inlet of Skaneateles Lake; square chisel mark on northwest bridge seat	870. 44

MARCELLUS STATION TO MARCELLUS.

	Feet.
Marcellus Station, road culvert west of; southeast corner of south coping stone on south wing wall	433.02
Limekiln, bridge across mill race opposite; square chisel mark on coping stone on north end of northeast wing wall	471.96
Marcellus Falls, at road running east, stone arch over creek below; square chisel mark on coping stone, west end of north parapet wall	514.61
Marcellus Falls; floor of iron bridge	539.49
Marcellus Powder Company, opposite north end of, at intersection of road running northeast; square chisel mark on bowlder east side of road	622.81
Marcellus Powder Works, iron bridge south of; square chisel mark on southeast bridge seat	612.47
Marcellus, North Street Presbyterian church; southeast corner of southerly mounting block	671.78
Marcellus, stone arch over Otisco Lake outlet (Ninemile Creek); square chisel mark on coping stone, north parapet wall	652.65
Marcellus, Main street, stone arch over Otisco Lake outlet (Ninemile Creek); copper bolt a little west of center, in fourth coping stone east from angle at west end of north parapet wall, marked "U. S. G. S. B. M. 655 ft."	652.657

SKANEATELES TO BORODINO.

Skaneateles, 1¼ miles east of; square chisel mark on bowlder west of elm tree on north side of road at forks of road, one running west and the other west-southwest	951.11
Skaneateles, 3 miles east of; square chisel mark on stone in southwest corner of road crossing, north of west parapet wall of pipe culvert under road from the south	1,008.71
Skaneateles, 3½ miles east of; square chisel mark on stone in southeast corner of intersection of road running south at schoolhouse	1,109.33
Clintonville, northwest corner of intersection of road running north; square chisel mark on stone near well	1,065.36
Clintonville; culvert under road from south; square chisel mark on stone at southeast end	1,088.79
Clintonville, 1 mile south of; square chisel mark on bowlder, east side of road and opposite road running west	1,178.25
Marietta, road from to Rose Hill; square chisel mark on piece of flagging, at intersection of, in southeast corner	1,269.06
Marietta Hotel, at corner of roads to Clintonville and Rose Hill; square chisel mark on foundation stone north corner of piazza	797.57
Otisco Lake, State dam, highway bridge below, on road from Marietta to Amber; square chisel mark, southwest corner of bridge seat	778.28
Otisco lake outlet, State dam; crest of spillway at west end, close to gate chamber	784.13
Otisco Lake outlet, State dam; square chisel mark near southeast corner of north coping stone, east wing wall	787.60
Otisco Lake outlet, State dam; copper bolt in south coping stone of east wing, marked "U.S.G.S. B.M. 789 ft"	787.65
Rose Hill and Thorn Hill; large bowlder east side of road midway between; square chisel mark	1,257.04
Thorn Hill, ¾ mile south of; square chisel mark on limestone bowlder, east side of road, opposite center of road running west	1,199.22
Thorn Hill, 1¼ miles south of; square chisel mark on stone at east end of culvert about 50 feet north of intersection of road running east and west	1,061.75

	Feet.
Borodino, 1 mile north of; square chisel mark on stone at south end of culvert across road running east	1,015.79
Borodino; nail in stump of flagstaff near lamp post at four corners	1,107.89
Borodino; top of ringbolt in mounting block in southwest corner of four corners	1,106.18
Borodino, Thorn Hill road, 215 feet south of intersection of first road running east from; copper bolt ¼ mile north of, in sandstone bowlder on east side of driveway, marked on north side "B.M." with chisel, marked "U.S.G.S. B.M. 1,021 ft."	1,019.058

GLEN HAVEN TO BORODINO.

Glen Haven Hotel, 2 miles east of; nail in notch cut in root on south side of twin cherry tree east of sharp bend in road from north to east	1,391.05
Glen Haven, intersection of road running west to and road running north to Spafford; northeast side of first tree (a maple) north of, nail in notch cut in root. The tree is further distinguished by anchor-shaped mark on north side about 5 feet from the ground	1,644.16
Spafford, ¼ mile south, in Bruce Norton's lot; copper bolt east side of road and 200 feet from fence on bank of small brook; marked "U.S.G.S. B.M. 1,654 ft."	1,652.327
Spafford; water-table at southeast corner of church in northwest corner of road crossing	1,693.24
Spafford, first road running west north of; square chisel mark in southwest corner of large laminated bowlder in southwest corner	1,740.47
Spafford, 3 miles north of; square chisel mark in capstone north end of pipe culvert across road from the east	1,587.81
Spafford, 3 miles north of; square chisel mark in capstone of northwest wing of pipe culvert 150 feet south of road running west	1,575.36
Borodino, 1¼ miles southeast of; square chisel mark on limestone bowlder on west side of road lying just outside of wheel track and 50 feet north of road running west	1,420.15
Borodino, 1 mile southeast of; bent nail in south root of hard maple tree in grass plot between north and south fork of road from the east	1,402.98

WILSONS CORNERS TO MORAVIA.

Wilsons Corners, ¼ mile south of; nail in lower crotch of small apple tree in northeast corner of intersection of road east	1,068.52
Gristmill, north of blacksmith shop, in northeast corner of road running east, west step/stone to stairs, marked "□ 917" with chisel	915.04
Moravia, cemetery; square chisel mark on limestone between two roads to south opposite main entrance	877.50
Moravia, East Cayuga and Factory streets; east cap bolt of hydrant	762.58
Moravia, Cayuga and Main streets; east cap bolt of hydrant	742.75
Moravia, Main and Church streets; north cap bolt of hydrant	744.14
Moravia, "Moravia House," corner Cayuga and Main streets; cross mark of bronze tablet in northeast corner of foundation, marked "U. S. Geological Survey B. M. Elevation 743"	740.841
Moravia, Church street, at top of Schoolhouse hill; capstone at north end of culvert, square chisel mark	871.26

LEHIGH VALLEY RAILROAD.

Moravia depot, 300 feet south of; iron bolt on southwest abutment of plate, girder bridge over Main Creek (railroad elevation, 731.560)	732.62

	Feet.
Locke Station, railroad bridge over Owasco Inlet 3,260 feet north of; iron bolt cemented in southeast abutment (railroad elevation, 781.085)	782.19
Peruville Station, spike in pine tree 2,047 feet north of north end of and 52 feet west of railroad track (railroad elevation 1,040.010)	1,041.09

MORAVIA TO CASCADE.

Owasco Inlet, near bridge over; most northerly tree (maple) in front of dwelling on road running north and south and facing road from Moravia running east; nail in north root	732.86
Cascade Hotel, south end of Owasco lake; northeast corner of water tank, marked "728 U.S.G.S."	725.56
Cascade Hotel; square chisel mark on stone west side of road running north and south at intersection of road running southeast from, marked with the letters "U.S.G.S."	1,108.28
Cascade Hotel, 1¼ miles northwest of; copper bolt in limestone bowlder 10 feet southwest of bridge over small brook on road running north and south, marked "U.S.G.S. B.M. 1,091 ft."	1,088.681

MORAVIA TO PERUVILLE VIA DRESSERVILLE AND M'LEAN.

Moravia, 1 mile east of; nail in east root of hard maple tree in northwest corner of intersection of road running north	1,116.16
Moravia, 3 miles east of; square chisel mark on southwest corner foundation stone of barn opposite road running south, also marked "1117 U.S.G.S." on stone above	1,114.70
Moravia, 3¼ miles east of; bowlder marked "U.S.G.S.," with chiseled square, lying north of fence and west from cherry tree in northwest corner of intersection of road running north	1,152.09
Dresserville, intersection of road running southeast to and road running east and west; square chisel mark on southeast bridge seat of bridge at.	1,113.00
Dresserville, 1 mile north of; square chisel mark on stone in southeast corner of road running east 12 feet south of small elm tree	1,215.84
Dresserville, Kenyons or Tannery lower dam; square chisel mark on eighth step from top of east wing	1,279.92
Dresserville, bridge at blacksmith shop and gristmill; square chisel mark on top stone of north abutment at northeast corner of	1,289.91
Dresserville, George Fitz's saw and grist mill; copper bolt in west end of doorsill to south door of boiler house, marked "U.S.G.S. B.M. 1,291 ft."	1,287.79
Schoolhouse in southeast corner of intersection of road running east and west; square chisel mark on stone with figures "1399"	1,397.14
Lake Como, nail in notch cut in north root of balsam tree in front yard of house in northeast corner of intersection of road running east and across inlet to	1,347.42
Lake Como, water level	1,306.16
Lake Como, opposite; square chisel mark with letters "U. S. G. S." and figures "1336" on stone at foot of southwest wing wall of small bridge 100 feet north of intersection of road running west	1,333.50
Lake Como, south end of; nail in notch cut in west side of apple tree, east side of road, opposite road running southwest	1,344.99
Fall Creek, bridge over, 200 feet east of road running north and south on road running east; square chisel mark on stone southeast corner of abutment	1,305.25
Lake Como, first four corners south of; square chisel mark, with figures "1334," on stone near southwest corner of road crossing, 27 feet west of west wheel track of road running north and south, and 35 feet south of center of road running east and west	1,332.00

	Feet.
Church on west side of road, snubbing stone at northeast corner of platform in front of; square chisel mark with letters "U.S.G.S." and figures "1429"	1, 426. 33
Groton City, 2¼ miles north of Fall Creek bridge; square chisel mark on capstone of west abutment north wing	1, 293. 29
Groton City, 2 miles north of; square chisel mark with letters "U.S.G.S." and figures "1334" on bowlder in southwest corner of intersection of road running east and west	1, 331. 33
Groton City, 1 mile north of; square chisel mark with figures "1310" on stone on west side of road 25 feet north of north line of road coming in from east	1, 307. 93
Groton City, ¼ mile north of; farm of George A. Bliss; copper bolt in bowlder 150 feet east of dwelling house and 125 feet east of road marked "U.S.G.S. B.M. 1,372 ft"	1, 369. 582
Groton City, southwest corner of road south to McLean east of Fall Creek; square chisel mark with figures "1290" on snubbing stone	1, 288. 01
Groton City, Fall Creek bridge; iron bolt in south bridge seat, east abutment	1, 273. 00
Groton City, 1 mile south of; bent nail in notch cut in west root of maple tree, southeast corner of road running east and west; tree has signs nailed to it and is marked in a blaze "1262"	1, 259. 91
Lafayette; south end of culvert on road running east and about 150 feet east of intersection of road running north and south, capstone marked with square chisel mark and the figures "1251"	1, 249. 21
Nubia post-office; bent nail in notch in root on south side of hard maple tree, 75 feet south of road running east and west	1, 251. 92
Nubia post-office; square mark and figures "1236" on south truss, on top of hanger of first joint west of center of bridge over Fall Creek	1, 233. 56
Nubia post-office, 1½ miles southwest of; square chisel mark, with figures "1201," on millstone used as mounting block in front of house in northwest corner of intersection of road running east and west	1, 198. 67
McLean, 1 mile northwest of; square chisel mark on capstone at east end of culvert on north side of road coming in from the west	1, 179. 58
McLean, corner of West and Mill streets; nail in east side of maple tree in southwest corner of intersection	1, 135. 07
McLean, east wall of mill race north of small bridge at west side of the square and south of the store and post-office; square chisel mark with legend "U.S.G.S. 1123"	1, 120. 12
McLean, North street, east side of; copper bolt in bowlder opposite upper part of graveyard, and 60 feet south of four evergreen trees planted in graveyard on a straight line with the road fence; stone is marked "U.S.G.S. B.M. 1234 ft." on west side	1, 231. 853
McLean, 1¾ miles west of; square chisel mark with figures "1380" on snubbing stone in northeast corner of crossing of road running north and south	1, 377. 74
McLean, 2¼ miles west of; square chisel mark with figures "1275" on bowlder near southeast corner of intersection of road running south	1, 272. 64
Peruville station, ¾ mile east of; square chisel mark with figures "1142" on snubbing stone in southwest corner of intersection of road running south	1, 139. 87
Peruville station, iron highway bridge, about 200 feet east of; square chisel mark with legend "U.S.G.S." and figures "1030" on southeast bridge seat	1, 027. 43
Peruville station, ½ mile west of; square chisel mark on small stone 6 feet west of the northeast corner of intersection of road north and south	1, 104. 75
Peruville, ¼ mile south of; square chisel mark on northeast bridge seat, small wooden highway bridge	1, 257. 84

PERUVILLE TO MORAVIA, VIA NORTH LANSING.

	Feet.
Peruville, ½ mile southwest of; square chisel mark on cornerstone, with legend U.S.G.S. 1322 in southwest fence corner of road running south	1,319.73
Peruville, 1 mile southwest of; square chisel mark with figures "1314" on stone on south side of road near small ash tree, opposite intersection of road	1,311.76
Peruville, 1½ miles west of; square chisel mark with figures "1364" on stone in southwest corner of intersection of road from the south	1,361.17
Peruville, 2½ miles west of; square chisel mark with legend "U.S.G.S. 1400" on southeast corner of stone step to front entrance of schoolhouse in southeast corner of intersection of road running south	1,397.23
Bensons Corners, 1½ miles south of; square chisel mark on stone in northeast corner of intersection of road running north	1,271.46
Bensons Corners, ½ mile south of; chiseled square, with letters "U. S. G. S"., on stône 300 feet north of road running east and west	1,294.07
Bensons Corners, ½ mile south of; copper bolt in bowlder in east fence, under most northerly of four butternut trees nearly opposite farmhouse, marked "U. S. G. S. B. M. 1320 ft."	1,318.270
South Lansing Hotel, 2¾ miles east of; square chisel mark with figures "1201" on most southerly capstone of culvert 100 feet east of road running north and south	1,198.72
South Lansing Hotel, 2 miles east of; square chisel mark and figures "1145" on highest point of bowlder on south side of south fence, opposite to and west of northwest corner of intersection of road running north	1,141.88
South Lansing Hotel, ¾ mile east of; square chisel mark and figures "956" on stone in northeast corner of intersection of road running to North Lansing	953.24
Midway, ½ mile north of; nail in root of first horse-chestnut tree on west side of road, north of road running east and west	956.87
Midway, 1 mile north of; square chisel mark and figures "986" on southwest bridge seat of small iron bridge about 200 feet south of road running east and west	983.48
North Lansing, 2 miles south of; square chisel mark and figures "1051" on snubbing stone in northeast corner of intersection of road running east.	1,047.99
North Lansing, 1½ miles south of; square chisel mark and figures "1016" on stone in southwest corner of intersection of road running east and west.	1,013.44
North Lansing, 1 mile south of; shop in northwest corner of intersection of road running east and west, square chisel mark with figures "938" on southwest corner of stone step, front entrance	935.89
North Lansing, ½ mile south of; square chisel mark on bowlder in southeast corner of intersection of road running east and west	913.23
North Lansing, R. Beardsley's store, at intersection of roads; square chisel mark and figures "1005" on snubbing stone at southeast corner	1,002.27
North Lansing, R. Beardsley's store; post south of and close to building, marked "U.S.G.S. B.M. 1,005 ft."	1,002.36
North Lansing, 1 mile east of; square chisel mark on snubbing stone at northwest corner of intersection of road running north and south	963.81
Locke, 3 miles southwest of; bridge at crossroads, square chisel mark, figures "944" and legend "U.S.G.S." on southeast bridge seat of	942.01
Locke, 2½ miles southwest of; square chisel mark, with chiseled cross just below, on stone on east side of road 125 feet south of intersection of road from the east	933.30
Locke, 2 miles southwest of; nail in root of hard maple tree at intersection of road running southwest and up-hill	903.18

	Feet.
Locke, 1½ miles southwest of; square chisel mark on northwest bridge seat of wooden bridge, 50 feet south of main road, on road to West Groton ..	897.13
Locke, 1¼ miles southwest of; nail in notch cut on east side of small elm tree, in west fence and 50 feet south of intersection of road running west; tree is blazed and marked "892"	890.40
Locke, ½ mile south of; square chisel mark on stone outlet to drain of house opposite road running south	815.37
Locke, George Culver's store, corner of Main and Mill streets; square on top of curbstone marked in front "U.S.G.S. 795"	793.45
Locke, ½ mile north of; square chisel mark on stone east end of culvert at intersection of road from east	794.27
Moravia, 1¼ miles south of; nail in root of butternut tree blazed and marked "761" at northeast corner of road running southeast	759.10

ORLEANS, GENESEE, NIAGARA, AND ERIE COUNTIES.

MEDINA, ALBION, LOCKPORT, RIDGEWAY, OAK ORCHARD, AND OLCOTT QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in front wall, east of door on Niagara street entrance to Niagara County court-house at Lockport, which is marked "U. S. Geological Survey. Elevation 616 feet. B.M." The elevation of this bench mark above mean sea level is based on the nearest State Canal bench mark. As reduced in accordance with the latest information, the height of this bench mark is 613.820 feet. The leveling was done by Mr. E. L. McNair, levelman, under the general direction of Mr. Frank Sutton, topographer:

	Feet.
Shelby Town, Coons Bridge, 125 feet north of; copper plug on top of bowlder 3 feet high, east side of road between East and West Shelby, marked "U.S.G.S. B.M. 616 ft."	614.636
East Shelby; copper plug in bowlder at southwest corner of Methodist Episcopal church, "marked U.S.G.S. B.M. 668 ft."	666.427
Medina, Prospect Street Bridge No. 140; lower step east end, north side of Erie Canal	516.10
Wheatville; copper plug in granite bowlder under northwest corner of red barn on land of John Waterstreet, 200 feet north of road-crossing and 3 feet east of fence line, marked "U.S.G.S. B.M. 669 ft."	667.062
Alabama Town; copper plug in second step, east abutment, north side of gate at entrance to canal feeder, marked "U.S.G.S. B.M. 622"	620.04
East Pembroke; top of rail in front of station, New York Central and Hudson River Railroad	880.10
East Pembroke, 1 mile north of; copper plug in bowlder 6 feet square, deeply embedded in ground on east side of north and south road, 630 feet north of corner, on land belonging to E. H. Clark, marked "U.S.G.S. B.M. 873 ft."	871.119
Pembroke railroad station, 1,550 feet east of; on bridge No. 104, Batavia and Tonawanda branch of the New York Central and Hudson River Railroad; copper plug in coping stone of east abutment, south side of track, marked "U.S.G.S. B.M. 823"	821.759
Middleport, Erie Canal Bridge No. 145; cross mark on bronze tablet in north foundation, under center of bridge and facing towpath and canal, marked "U.S.G.S. Elevation B.M. 519 ft."	517.255

	Feet.
Barre Town, E. E. Allis's house, north side of first road east, north of West Barre on road to Eagle Harbor, ¾ mile east of north and south road; copper plug in lower of three stone steps before eastern front door, marked "U.S.G.S. B.M. 666 ft."	664.184
South Barre; copper plug in stone door-sill of district schoolhouse No. 9, 220 feet east of road-crossing; marked "U.S.G.S. B.M. 652 ft."	650.525
Albion, Orleans House, corner of Platt and Bank streets; bronze tablet in Platt street side, 40½ feet from Banks street corner, 7.7 feet from office door, marked "U.S.G.S. Elevation B.M. 521 ft."	518.949
Holley, Erie Canal Bridge No. 115, Webster warehouse, south and west of; copper plug in door sill of only door on canal side, marked "U.S.G.S. B.M. 514 ft."	512.225
Clarendon Town, opposite Andrew Kuhn's house, on land belonging to Mrs. Butcher, ½ mile north of county line; copper plug in granite bowlder, marked "U.S.G.S. B.M. 648 ft."	646.017
Elba Town; copper plug in granite bowlder 2.6 feet high at southwest corner of junction of east-and-west road and road south. The east-and-west road is the first road north from Langton Corners, and the north-and-south road is the first one turning north going east from Langton Corners. Plug is marked "U.S.G.S. B.M. 675 ft."	673.517
Elba Town, East Oakfield, 1¼ miles east of; copper plug in bowlder 65 feet southeast of district schoolhouse No. 9, 15 feet from road corner on west side of north road, marked "U.S.G.S. 709 ft."	707.023
Byron, 1,710 feet west of railroad station; copper plug in next to upper step of large culvert across Black Creek, north of New York Central and Hudson River Railroad Company's tracks and 27 feet from center of north track; marked "U.S.G.S. B.M. 682 ft."	680.144
Gaines Town, W. H. Banker's house on west side of transit road, 600 feet north of Murray and Gaines Baptist Church; copper plug in stone 3 feet square and 1½ feet high in door-yard on south side of and 12 feet from dwelling; marked "U.S.G.S. B.M. 458 ft."	456.103
Murray, 610 feet north of road crossing on west side of road, 81 feet southwest of stone schoolhouse; copper bolt in bowlder, 3 feet wide 2 feet high, marked "U.S.G.S. B.M. 410 ft."	408.458
Fairhaven, 1,200 feet south of, on east side of road to Albion; copper bolt in top of stone masonry wall in front of Mrs. Dixon's house, marked "U.S.G.S. B.M. 439 ft."	437.171
Jeddo, copper plug in top of bowlder 3.3 feet high, in road corners, 50 feet from doorway of schoolhouse and 153 feet from doorway of Adventist Church; marked "U.S.G.S. B.M. 421 ft."	418.838
Oak Orchard, iron bridge across Oak Orchard Creek; copper bolt in abutment 6 feet from southwest corner, 1,000 feet east of post-office; marked "U.S.G.S. B.M. 370 ft."	368.499
Eagle Harbor, Gaines Town, Erie Canal bridge No. 131; copper plug in lower step, east wing, towpath side, marked "U.S.G.S. B.M. 516 ft."	514.559
East Clarence, 2,400 feet east of; copper plug in coping stone, east abutment at south end of bridge No. 114, Batavia and Tonawanda branch New York Central and Hudson River Railroad, marked "U.S.G.S. 639 ft."	637.049
Transit, 700 feet west of railroad station; copper plug in west abutment next to lower step, south side of bridge No. 119, Batavia and Tonawanda branch New York Central and Hudson River Railroad, marked "U.S.G.S. B.M. 587 ft."	587.533
Pendleton Town; Erie Canal guard, lock bridge No. 168; copper plug in north end of east pier; marked "U.S.G.S. B.M. 582 ft."	579.818

	Feet.
Dysingers Corners, William Dysinger's red barn; cross mark in bronze tablet in southwest corner of foundation, marked "U.S.G.S. Elevation B.M. 628 ft."	626.387
Gasport, Erie Canal bridge No. 152; copper plug in east abutment, north end, marked "U.S.G.S. B.M. 521 ft."	518.992
Lockport, Niagara County court-house; cross mark on bronze tablet in front of, east of main door, Niagara street entrance; marked "U.S.G.S. Elevation B.M. 616 ft."	613.820

NIAGARA COUNTY, ORANGEPORT TO DYSINGERS CORNERS.

McNalls Corners; square chisel mark southeast corner of doorstep of large brick house on northwest corner of road crossing	657.73
Dysingers Corners, near house of William Dysinger; rock at northeast corner of road crossing	622.47

NIAGARA COUNTY, LOCKPORT TO DYSINGERS CORNERS.

Lockport, High street opposite Beatty avenue; top of hydrant spindle	652.53
Lockport and Dysingers Corners, road at bend to southeast, 2 miles from Lockport; square chisel mark on westernmost of two bowlders	636.55
Dysingers Corners, road corner 4 miles west of; square chisel mark on bowlder opposite brick house near	624.75
Dysingers Corners, about 2 miles west of; top of large bowlder, north side of road near corner turning north, square chisel mark	599.10

LOCKPORT NORTH, ON OLCOTT ROAD 6¼ MILES TO CEMETERY, THENCE EAST TO HESS ROAD, THENCE SOUTH TO RIDGE ROAD, THENCE EAST TO HARTLAND, THENCE SOUTH TO GASPORT.

Lockport; square chisel mark on stone monument at northwest corner of road intersection, near Home for the Friendless	491.54
Tollgate, 400 feet north of; square chisel mark on granite bowlder 5 feet west of cycle path	487.10
Eighteenmile Creek; square chisel mark on north abutment, west end of bridge	364.11
Wrights Corners, northeast corner of stone watering trough at town pump	401.20
Wrights Corners, 1¼ miles north of, on Olcott road; square chisel mark on flat rock, south end of stone culvert over ditch, light yellow house on east side	358.59
Cemetery, Pettit lot in southeast corner; in loop of capital P on lot monument, southeast corner	355.60
Checkered Tavern Cross Roads, 1¼ miles east of Ridge road; nail in old stump at southwest corner of road intersection	409.27
North Hartland, road junction running north to; nail in stump, northwest corner of roads	405.42
Hartland, ¾ mile west of, north side of Ridge road; corner of second doorstep, west end of brick house	406.38
Hartland; square chisel mark on large bowlder at southwest corner of road intersection	404.55
Gasport, 1½ miles north of; square chisel mark on large bowlder nearly in front of large plaster house on east side of road	425.99
Gasport; canal bench mark on east abutment, towpath side of Erie Canal bridge, marked with chiseled square	518.99
Hartland, ¾ mile north of, in front of W. T. Curtiss's house; copper bolt in granite bowlder nearly embedded in ground in line of ditch, west side of road, marked "U.S.G.S. B.M. 376 ft"	373.92

	Feet.
Newfane Town; copper bolt in granite bowlder 30 feet southeast of District school No. 16, on road running east and west between Lake and Hess roads, about 3 miles north of Wrights Corners, marked "U.S.G.S. B.M. 363 ft."	361.146

CATTARAUGUS AND ALLEGANY COUNTIES.

OLEAN QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the foundation stones of the city building at Olean, which is marked "U. S. Geological Survey. Elevation 1459 feet. B.M." The elevation of this bench mark above mean sea level is based on the top of rail in front of center of the Western New York and Pennsylvania Railroad station in Olean. The best possible reduction of the profile of this railroad was made, resulting in an elevation at this point of 1,434.143 feet, and, in accordance with this, the height of the bench mark is 1,457.456 feet. The leveling was done by Mr. E. L. McNair, levelman, under the general direction of Mr. Frank Sutton, topographer.

OLEAN TO PORTVILLE.

	Feet.
Olean, Western New York and Pennsylvania Railway station, top of rail opposite	1,434.14
Olean, city building; cross mark on bronze tablet in foundation stone, just beneath water-table in northwest corner of building, Union street side, marked "1459"	1,457.458
Olean, Union street, near Western New York and Pensylvania Railway station, highest point of rim of water plug embedded in rock in front of "Old Homestead" saloon	1,434.101
Olean, east end of Tompkins street, outer rim south side of eastern of two sewer traps in middle of street	1,430.87
Portville road, nearly opposite tannery chimney; spike in wooden post 2 feet high, south side of road	1,435.49
Haskell Creek highway bridge, near Westons Mills; top of coping stone, east abutment, near southeast corner	1,431.45
Portville road, white house on south side of; northeast corner of horse block	1,439.13
Riverhurst Park; top of iron strap, northwest corner of watering trough, north side of road	1,440.72
Allegheny River highway bridge; west end of north abutment	1,438.71
Portville, ½ mile west of; southeast corner stone horse block north side of road	1,432.38
Portville; southeast corner of stone horse block on north side of street, name Wheeler on front	1,439.90
Portville, Western New York and Pennsylvania Railway station; top of rail opposite	1,442.07
Portville, Clarksville road; stone horse block in front of Mr. Hutton's house, east side of street	1,439.55
Portville, Presbyterian Church; copper plug in upper stone step at entrance, marked "U.S.G.S. B.M. 1640 ft."	1,437.800

OLEAN TO HINSDALE.

Tannery; top of hydrant near entrance to back yard	1,433.69
Erie Railroad, 150 feet north of; top of stone monument 9 inches square	1,437.54

	Feet.
Erie Railroad crossing, ¾ mile north of Western New York and Pennsylvania Railway; top of outer rail of main track at curve	1, 435. 77
David Porter's house; northeast corner of upper stone doorstep	1, 481. 98
Erie Railroad crossing, 2 miles north of; east side of center abutment of small railroad bridge	1, 448. 71
White house east side of road, stone horse block in front of	1, 442. 92
Hinsdale, 1½ miles south of Olean Creek bridge, Faye Hollow highway; copper plug in capstone of bridge foundation, marked "U.S.G.S. B.M. 1449 ft."	1, 447. 639
Hinsdale, 1 mile south of; thread end of lower iron rod in west end of watering trough on east side of road	1, 465. 79
Hinsdale, north end of; Oil Creek bridge, post plate of iron post, southeast corner of	1, 458. 50

HINSDALE TOWARD ISCHUA.

Scotts Corners; wooden horse block in northeast corner of road intersection	1, 471. 13
Scotts Corners, ½ mile north of; point in chiseled circle on corner of stone horse block in front of white house on east side of road	1, 499. 26
Scotts Corners, 1 mile north of, near Olean Creek bridge; point in chiseled circle on bowlder embedded in ground	1, 498. 21
Scotts Corners, 1½ miles north of; chiseled circle on point of large bowlder at turn in road	1, 499. 93
Ischua Town, Hinsdale-Ischua road; copper plug in large flat stone in base of stone wall under barn of Harris Johnson, south side of barn, west side of road; marked "U.S.G.S. B.M. 1544 ft."	1, 541. 918

HINSDALE TO CUBA AND TOWARD CLARKSVILLE.

Brown house, east side of road; chiseled point of bowlder nearly embedded in ground in front of	1, 584. 29
Hinsdale, 1 mile northeast of, in unfenced meadow; top of bowlder 30 feet east of road	1, 558. 60
Erie Railroad stone culvert; chiseled point on fourth step from bottom	1, 481. 24
Erie Railroad stone culvert; chiseled circle around point on northwest corner of west end	1, 516. 23
Erie Railroad track, 15 feet west of center of; point of bowlder, chiseled	1, 520. 14
Cuba, 2 miles west of; large flat bowlder at corner of road leading to Lake Cuba	1, 507. 60
Cuba, 1¾ miles west of; top of old rusty nail in west end of watering trough, north side of road	1, 493. 49
Cuba, A. J. Van Fleet's music store; bowlder at corner of street in front of.	1, 504. 96
Cuba, water plug under Erie Railroad stone-arch bridge	1, 518. 54
Wooden bridge, small; top of capstone of south abutment	1, 551. 17
Kuhn's (Peter) residence; point in chiseled circle on stone horse block in front of	1, 624. 56
Cuba, 1½ miles south of; rounded point of flat bowlder embedded in ground near edge of creek just below bridge	1, 637. 62

PORTVILLE TO CLARKSVILLE.

Clarksville road, west side of; top of iron staple on wood hitching post in front of white house, dark green blinds and trimmings	1, 515. 04
Bedford Corners; top of bowlder at corner of picket at northwest corner of intersection of roads	1, 493. 26
Bedford Corners, 1½ miles northeast of, just above spring on northwest side of road; oblong bowlder	1, 539. 06

	Feet.
Bedford Corners, 2 miles northeast of; stone horse block in front of white house on southeast side of road	1,548.64
Seventh Day Baptist church, first house south of, on east side of road; highest corner of stone horse block (house is 2 stories high, painted white, and weather-stained)	1,546.71
Genesee town, Portville-Clarksville road, near Obi, at Seventh Day Baptist church; copper plug in large flat rock on west side of road, 3 feet from fence, 10 feet from center of road, and 85 feet from the church doors, on land belonging to Mrs. E. B. Adams; marked "U.S.G.S. B.M. 1547 ft."	1,545.557
Cemetery, 750 feet northeast from; top of small bowlder right-hand side of bars at entrance to pasture, southeast side of road	1,530.09
Obi, ¼ mile south of; rock foundation at southeast corner of small wooden bridge	1,520.59
Obi, 1 mile north of; bowlder embedded in ground on east side of road, 100 feet south of bridge	1,590.92
Clarksville, ¾ mile south of; bowlder inside fence of pasture near willow bushes	1,561.55

CLARKSVILLE TO CUBA.

Clarksville, M. M. Congdon's residence; copper bolt in stone horse block; marked "U.S.G.S. B.M. 1604 Ft."	1,601.700
Clarksville, corner of stone horse block on west side of street, marked "A. Cogdon"	1,599.83
Clarksville, 2 miles north of, 750 feet west of signboard; chiseled point on top of bowlder north side of road	1,684.13
Congdon's (M. M.) white house (green blinds), in front of, on southwest side of road; chiseled point of bowlder almost embedded in ground, nearly under wire fence	1,723.79
Compton's (Almon) house, east side of road; chiseled point on stone horse block at side door	1,852.69
Clarksville, 2¾ miles north of; chiseled point on top of very large flat bowlder on west side of road, 85 feet south of watering trough	1,947.43
Clarksville, road to right going toward; chiseled point on small bowlder inside of fence at bend in said road	1,988.29
Cuba, 2¾ miles south of; top of spike in block supporting south end of watering trough on west side of road opposite road from east	1,748.37
Cuba, 2 miles south of; creek just below small bridge; rounded point of flat rock 2 feet above water surface	1,637.82
Cuba, Union street; bronze tablet, in north end of the western of two piers of stone-arch bridge, Erie Railroad, marked "1524"	1,522.410

MARYLAND AND DELAWARE.

CECIL, KENT, AND QUEEN ANNE COUNTIES, MARYLAND, AND KENT AND NEWCASTLE COUNTIES, DELAWARE.

ELKTON AND DOVER QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the stone foundation on the west side of the front corner of the National Hotel at Middletown, Delaware, marked "U. S. Geological Survey 65 feet B. M." The elevation of this bench mark above mean sea level was accepted as 65.044 feet, and is based on a copper bolt in the doorsill of the waiting room of the Middletown station of the Pennsylvania Railroad, as obtained from the precise levels of that company.

The leveling was under the direction of Mr. H. S. Wallace, topographer, and was done by Messrs. O. L. Pettibone and Charles Goldsborough, levelmen, and M. P. Page, rodman.

MIDDLETOWN VIA BOHEMIA MILLS AND CHESAPEAKE CITY TO ELKTON.

	Feet.
Middletown; bronze tablet, west side of front corner of National Hotel, near depot; marked "65"	65.044
Middletown, railroad station; copper bolt (Pennsylvania Railroad bench mark) in doorstep of ladies' waiting room, marked "17"	64.28
Middletown, People's National Bank; southeast corner of bottom step	66.94
Middletown, ½ mile west of; nail in root of maple tree in front of small house 200 feet west of crossroads	63.10
Bohemia Mills, ¾ mile east of; nail in root of large walnut tree on south side of road	53.39
Bohemia Mills; nail in root of large sycamore tree in front of Old Mills	14.67
Bohemia Mills, ¼ mile north of; highest point on large whitewashed stone at corner of plank fence entrance to farmhouse	59.68
Bohemia Mills, 1 mile north of; highest point of large flat stone northeast corner of road to Chesapeake City, at entrance to barnyard	75.10
Bohemia Mills, 1¾ miles north of; large whitewashed stone at northwest corner of entrance to farmhouse at corner of picket fence	73.93
Bohemia Mills, 2¼ miles north of; highest point of large flat stone at corner of road at entrance to farmhouse	69.59
Chesapeake City, 2 miles south of; nail in root of three-pronged willow tree on west side of road 100 feet south of mill	8.07
Chesapeake City, 1½ miles south of; nail in root of large black gum tree northwest corner of Pivot Bridge road	53.03
Chesapeake City, First and George streets; nail in root of maple tree at southeast corner of intersection	23.97
Chesapeake City, entrance to George R. Ross's store; bronze tablet in north end of doorsill of hall, marked "17"	17.354
Chesapeake City; granite stone southwest corner of iron fence by canal road	25.71
Chesapeake City, 1 mile north of, in Mr. Harriott's yard; top of large red bowlder west side of road	63.69
Long Creek, bridge over; top of first bolt in guard rail, southeast corner.	9.29
Chapel and Barker roads; stone at southeast corner of	63.08
Perch Creek, bridge over; sharp point of stone in southwest corner of abutment	10.56
Elkton, 3½ miles from; large stone, east side of road, north side of old railroad grade	32.71
Elkton, 3⅛ miles south of; nail in root of large maple tree west side of road 150 feet east of branch; corner of Denny's yard	28.14
Elkton, 3¼ miles south of; highest point of large stone west side of road at top of hill	62.31
Elkton, 2¾ miles south of, at Crouch Chapel; nail in root of large cedar tree	70.66
Elkton, ¼ mile south of; nail in root of locust tree north of road, 10 feet south of stone gate post	18.17
Elk River, southwest corner of bridge at; top of iron post	13.53
Elkton, on top of step of south entrance to county court-house; copper bolt, marked "U.S.G.S. 28 ft. B.M."	27.948
Elkton, railroad station; copper bolt in doorsill	29.50

CHESAPEAKE CITY, VIA CAYOTS CORNERS, BOHEMIA BRIDGE, AND EARLVILLE, TO FREDERICKTOWN.

	Feet.
Chesapeake City, ¾ mile south of; nail in root of large chestnut tree east side of road 15 feet from center of road at top of hill	67.20
Back Creek, bridge over; top of coping, northeast abutment	21.76
Cayots Corners, 1 mile north of; nail in root of cedar stump in front of schoolhouse door	73.56
Cayots Corners; nail in root of locust tree in front of store	82.27
Cayots Corners; iron post at fork of roads, marked "83"	83.15
Cayots Corners, ½ mile south of; top of round stone projecting above plaster in east abutment of culvert	72.27
Bohemia River bridge, 200 feet from north end of; nail in root of large sycamore tree	8.70
Bohemia River, bridge over branch of; edge of coping of abutment, north end	10.10
Bohemia bridge, 1 mile from, in front of small white house; nail in root of large oak tree, north side of road	32.65
Bohemia bridge, 1¾ miles from, at whitewashed gate by corner of hedge fence; highest point on stone east side of road	66.24
Johntown church, 300 feet north of; nail in root of old, partly dead, cherry tree	84.28
Earlville; bronze tablet set in stone in front of S. Duhamel's store, marked "85"	84.862
Earlville, ¾ mile from; nail in small persimmon stump, northwest corner of Cecilton and Fredericktown roads	76.54
Fredericktown; nail in root of cigar tree 50 feet east of north side of bridge over Sassafras River	3.37

FREDERICKTOWN, VIA GALENA, LOCUST GROVE, BLACKS, CRUMPTON, BENTONS CORNERS, AND CHESTERVILLE, TO BARCLAY.

	Feet.
Fredericktown; bronze tablet in face of northwest wing wall of bridge over Sassafras River, marked "5"	5.080
Georgetown; northwest corner of stone step at entrance to house with iron fence and stone gateposts	51.56
Galena, ½ mile north of; west corner of large stone, marked "A," northeast corner of road	66.36
Galena; highest point of stone corner of picket and plank fence on west side of road, by large locust tree	72.43
Galena, ¾ mile south of; south edge of northwest corner of top of iron girder of bridge	29.21
Galena, 1½ miles from; nail in knot of middle gatepost of double gates, north side of road	65.18
Locust Grove; nail in root of large willow tree projecting under picket fence at corner	78.09
Locust Grove; iron post 40 feet north of crossroads and east side of Beaston's house, marked "76"	76.738
Blacks Station; highest point on stone foundation of middle pillar of porch in front of store	67.77
Crumpton; nail in root of maple tree in front of blacksmith shop	21.20
Crumpton, 1½ miles south of; Kirby's cheap cash store at southeast corner of crossroads; cornerstone under pillar northwest corner of porch	66.06
Bentons Corners, 1 mile north of, and 2 miles west of Sudlersville; nail in root of large oak tree northwest corner of old church built 1783, rebuilt 1883	50.57
Bentons Corners, 600 feet west of; bronze tablet in northeast corner of foundation stone of farmhouse, marked "60"	60.421

	Feet.
Chesterville; iron post at corner of brick storehouse, north corner of crossroads, marked "55"	55.339
Chesterville, 1¼ miles northwest of; top of large sandstone west side of Chesterville-Blacks road	48.78
McFaddens Mills, 1¼ miles north from; top of large stone west side of Barclay-Crumpton road at corner of hedge fence and 200 feet from small frame dwelling west of railroad	63.78
Dudley Church, ⅛ mile north from, on Barclay-Crumpton road, at southeast corner crossroads; nail in root of small persimmon tree	42.23
Barclay, 3 miles north of; nail in root of small black walnut tree on north side of road to Crumpton	66.64
Barclay, 1 mile north of; Queen Anne, Kent and Townsend Branch Railroad, 50 feet west of crossing of; top of large stone, southwest corner of road	69.36
Dixons Tavern, 50 feet from corner of crossroads; nail in root of maple tree	64.07

SUDLERSVILLE, VIA MILLINGTON, TO MASSEY.

Sudlersville, corner of Church and Main streets; bronze tablet, northeast corner of foundation of store, marked "66"	66.298
Sudlersville, 1 mile north of; top of large stone, corner of fence at entrance to farmhouse	68.82
Sudlersville, 2 miles north of; nail in root of large locust tree by corner of fence	64.72
Mallorys Mills; top of bolt in end of retaining wall, northwest corner, by wire fence	10.74
Sandtown, bridge over Chester River near; highest point of large stone, southeast corner of bridge, 3 feet from lamp-post	8.52
Millington, northeast corner of Cypress and Sassafras streets; south corner of stone	24.50
Millington, northwest corner of Cypress and Sassafras streets; copper plug in doorsill of store; marked "U.S.G.S. 26 ft. B.M."	26.547
Millington, bridge 1 mile north of; southwest corner of southwest abutment	30.01
Millington, 2 miles north of; nail in cedar root, east side of road opposite farmhouse gate painted brown	53.00
Massey; nail in root of large walnut tree in front of blacksmith shop	63.89

MASSEY, VIA SASSAFRAS AND WARWICK, TO BOHEMIA MILLS.

Massey; bronze tablet, southeast corner of foundation of Walsberger's store, northwest corner of crossroads	65.17
Massey, 1¾ miles north of; nail in root of large wild-cherry tree, east side of road, 30 feet from hedge fence	64.63
Sassafras, 2 miles north of; nail in root of willow tree in clump of willows 400 feet south of crossroads	62.16
Sassafras, dwelling of Mr. Earnest; copper plug in step to back porch, marked "U.S.G.S. 34 Ft. B.M."	34.191
Sassafras; northeast corner of southwest abutment of bridge over Sassafras River	22.34
Sassafras, 1 mile north of; nail in root of walnut tree at corner of road	65.81
Sassafras, 2 miles north of; nail in root of large locust tree north side of road	68.05
Warwick, ¾ mile south of; nail in root of stump used for post of wire fence, southwest corner of road	67.59
Warwick, southwest corner of crossroads; highest point of stone, edge of gutter	70.60

	Feet.
Warwick, ¼ mile north of; highest point on old boundary stone 100 feet west of corner, marked "3rd of Atkinson"	67.46
Warwick, 1 mile north of; nail in root of large cherry tree inside fence	72.04
Bohemia Mills, 1⅛ miles south of; nail in root of large oak tree southwest corner of crossroads, 2 miles north of Warwick	16.98
Bohemia Mills, top of hill ½ mile south of; nail in root of large sycamore tree in front of store	43.94

MIDDLETOWN VIA ODESSA AND TOWNSEND TO MASSEY.

Middletown, 1 mile east of, at crossroads; nail in top of stump of old telegraph pole cut off 1 foot from ground, north side of roads	64.42
Odessa, ½ mile west of; nail in root of large cherry tree in front of large frame house south side of road	63.41
Odessa, northwest corner of Sixth and Main streets; top of corner stone	51.98
Odessa Bank, southwest corner of front, bottom step at entrance	42.57
Odessa, 1¼ miles south of, in front of schoolhouse; nail in root of maple tree at fork of road	31.61
Odessa, 1¼ miles south of; bronze tablet in foundation of schoolhouse at fork of road, marked "37"	37.476
Odessa, 2½ miles south of; northeast corner of southwest abutment of bridge over Hangmans Creek	9.84
Odessa, 3¼ miles south of; nail in root of large, hollow gum tree, corner of Odessa and Stage Landing roads	39.40
Odessa, 3¼ miles south of, at fork of road to Fieldsboro; nail in root of oak tree at northwest corner of schoolhouse	57.30
Odessa, 4¼ miles south of; nail in root of large sycamore tree 150 feet north of corner	38.75
Beaver Branch, bridge over; northeast corner of southwest abutment	9.26
Townsend, 3 miles northwest of; bronze tablet in northwest corner of foundation of shed of John Corbett's small house, marked "60"	59.884
Townsend, 2 miles northwest of; nail in root of maple tree, southwest corner of crossroads in front of brick church	55.86
Smyrna road and Lazy lane; large stone in triangle at intersection, marked with letter H in chiseled circle	62.07
Townsend, 1½ miles south of; top of right-of-way post east side of Pennsylvania Railroad tracks, 150 feet north of road crossing	56.18
Townsend, southwest corner of hotel; copper plug marked "U.S.G.S. 64 ft. B.M.," 8 inches from corner of curb	63.875
Townsend, 1 mile south of; top of milestone, Townsend branch of Philadelphia, Wilmington and Baltimore Railroad	53.81
Townsend, 2 miles south of; top of milestone, Townsend branch of Philadelphia, Wilmington and Baltimore Railroad	69.06
Townsend, top of third milestone south of, on Townsend branch of Philadelphia, Wilmington and Baltimore Railroad	81.02
Vandyke station, 100 feet south of; top of right-of-way post Philadelphia, Wilmington and Baltimore Railroad, west side of track	80.50
Townsend, fifth milestone south of; top of	77.19
Massey, 1½ miles north of; top of right-of-way post, east side of railroad track	63.92
Massey, ¼ mile north of; top of milestone Philadelphia, Wilmington and Baltimore Railroad	61.94

MASSEY VIA DELANEYS AND HAZEL CORNERS TO HARTLEY.

Massey, 1 mile east of; nail in root of persimmon tree at turn of road	54.38
Massey, 2½ miles east of; nail in root of small oak tree north side of road	50.59

	Feet.
Massey, 3½ miles east of, at Maryland and Delaware State line; top of boundary stone	67.50
Massey, 4¼ miles east of, at Cypress Branch; northwest corner of northeast abutment of bridge	51.55
Harlots Corners, 1¼ miles south of Delaneys; nail in root of large white-oak tree at crossroads	69.32
Delaneys, 2½ miles south of; nail in root of hickory tree at corner of road in front of farmhouse 1¼ miles south of Harlots Corners	66.47
Hazel Corners, 4½ miles south of Delaneys; nail in root of large oak tree.	69.59
Hazel Corners, northeast corner of schoolhouse; bronze tablet marked "70"	70.098
Hazel Corners, 1½ miles south of; nail in root of elm tree east side of road.	63.68
Blankers Corners, 500 feet east of; nail in root of oak tree north side of road	63.14
Blankers Corners, ¼ mile from; nail in root of chestnut tree southeast corner of road	67.70
Downs Chapel, 1 mile west of; nail in root of gum tree north side of road.	59.88
Downs Chapel, ½ mile west of; top of boundary stone corner of fence, east side of road	63.73
Downs Chapel, crossroads; nail in root of elm tree at northeast corner, at corner of fence	63.69
Downs Chapel, 2½ miles south of; nail in root of oak tree in front of small house	74.69
Hartley, ¾ mile north of; nail in root of walnut tree north side of road...	68.48
Hartley, Joseph Poor's hotel; bronze tablet in southwest corner of foundation, marked "74"	73.576
Hartley, 100 feet north of hotel; nail in root of oak tree north side of road.	69.09

BARCLAY VIA TILGHMAN, INGLESIDE, HOLLINGSWORTH CROSSROADS, GOLDSBORO, HENDERSON, AND MARYDEL TO HARTLEY.

	Feet.
Barclay, 1½ miles north of, at road forks, 50 feet west of Queen Anne, Kent and Townsend Branch Railroad; stone in southwest corner	69.36
Barclay, Queen Anne, Kent and Townsend Branch Railroad; top of milepost 15-20	76.97
Barclay, Queen Anne, Kent and Townsend Branch Railroad; limit stone of depot lot, 30 feet north of station building	67.66
Barclay, 1 mile west of, on Queen Anne, Kent and Townsend Branch Railroad; top of milepost 13-22	78.76
Barclay, 2 miles west of, on Queen Anne, Kent and Townsend Branch Railroad; nail in root of large red-oak tree, north of track, 200 feet west of milepost 12-23	75.36
Roberts, ½ mile east of, on Queen Anne, Kent and Townsend Branch Railroad; nail in root of water-oak 50 feet south of track and 60 feet west of milepost 11-24	76.16
Roberts; nail in root of red-oak tree 70 feet north of railroad	74.49
Roberts; iron post at southeast corner of Scott's store, marked "78"	77.985
Roberts, Queen Anne, Kent and Townsend Branch Railroad, ¾ mile from, on public road to Ingleside; nail in root of cedar tree north side of road.	75.91
Roberts, ¾ mile from, on public road to Ingleside; nail in root of persimmon tree south side of road	70.95
Ingleside, northeast of crossroads at; nail in root of maple tree in corner of Beatty's yard	61.61
Ingleside; iron post southwest corner of Beatty's yard, marked "62"	61.901
Ingleside, 1 mile east of, on public road to Hollingsworth's Crossroads; nail in root of willow-oak tree, north side of road	58.16

	Feet.
Ingleside, 2 miles southeast of, on public road to Hollingsworth's Crossroads; nail in root of sweet gum tree, north side of road	54.43
Ingleside, 3 miles east of; nail in root of birch tree south side of road 300 feet west of Baltimore Corners	52.21
Hollingsworth's Crossroads, ¼ mile northwest of; nail in root of sweet gum tree south side of road, 150 feet west of fork of roads	66.30
Hollingsworth's Crossroads; nail in root of small chestnut tree north corner of road	65.58
Hollingsworth; iron post south corner of crossroads, outside of garden fence, marked "66"	66.314
Goldsboro, 1¼ miles west of, on road from Hollingsworth's Crossroads; nail in root of white-oak tree south side of public road	61.37
Goldsboro, ¼ mile west of, at crossroads; nail in root of red-oak tree	61.41
Goldsboro, Delaware and Chesapeake Railroad; nail in root of hickory 100 feet northeast of station and southeast side of track	61.08
Goldsboro, 2.7 miles northeast of; top of limit post Delaware and Chesapeake Railroad, southeast side of track, near stream	53.22
Goldsboro, 3.6 miles northeast of; nail in root of hickory tree 70 feet west of Delaware and Chesapeake Railroad track	60.78
Goldsboro; bronze tablet on east corner of railroad station, marked "63".	62.863
Henderson, ¾ mile northeast of; top of Delaware and Chesapeake Railroad milepost 16–38	60.09
Henderson, 1¾ miles northeast of; top of Delaware and Chesapeake Railroad milepost 15-39	59.41
Marydel, ½ mile southwest of; top of Delaware and Chesapeake Railroad milepost 14–40	63.14
Marydel; bronze tablet, south end of freight house, marked "63"	62.87
Marydel, ⅜ mile northeast of; nail in root of white-oak tree 35 feet west of Delaware and Chesapeake Railroad	57.34
Marydel, 1¼ miles northeast of; Delaware and Chesapeake Railroad milepost 12–42, 500 feet northeast of; nail in root of white-oak tree, 50 feet east of track	65.18
Marydel, 2½ miles northeast of; Delaware and Chesapeake Railroad, milepost 11–43, 200 feet northeast of; nail in root of white-oak tree, 40 feet east of track	69.83

HARTLEY, VIA CLAYTON, TO WHITEHALL CROSSROADS.

Hartley, 1 mile north of; Delaware and Chesapeake Railroad milepost 45–9, 500 feet northeast of; top of limit post on east side of track at edge of woods	69.65
Hartley, 2 miles north of; Delaware and Chesapeake Railroad milepost 46–8, 2,900 feet northeast of; top of limit post on east side of track at edge of woods	72.13
Hartley, 4 miles north of; Delaware and Chesapeake Railroad milepost 48–6, 2,000 feet northeast from, on west side of track; top of limit post.	62.28
Kenton, ½ mile northeast of; top of Delaware and Chesapeake Railroad limit post, east side of track	63.64
Kenton, 1 mile northeast of; top of Delaware and Chesapeake Railroad milepost 51–3	59.20
Clayton, 2 miles southwest of; top of Delaware and Chesapeake Railroad milepost 52–2	58.63
Clayton, 1 mile southwest of; Delaware and Chesapeake Railroad milepost 53-1, 30 feet from; top of limit post	49.04
Smyrna, station, 800 feet southwest from; on granite stone east corner of street running eastward	45.85

	Feet.
Smyrna, corner of Frazier and Galloway streets; top of fire plug	39.35
Smyrna-Leipsic road, 400 feet from the Telegraph road; top of planted stone	41.13
Smyrna-Leipsic road, 2,800 feet east of Telegraph road; top of stone near two cedar trees and 400 feet east of small dwelling	20.60
Smyrna-Leipsic road, 1½ miles east of Telegraph road; nail in root of chestnut tree, south side of road	12.18
Smyrna-Leipsic road, 2¾ miles from Telegraph road; nail in root of cedar tree, north side of road	19.90
Raymond's Brick Church, 50 feet east of; nail in root of black-gum tree	18.03
Whitehall Crossroads, northeast corner; nail in root of mock-orange tree	19.03
Whitehall Crossroads; iron post northeast corner of crossroads, marked "19"	19.426

CLAYTON, VIA BINGHAM AND DELANEYS, TO MASSEY.

Clayton; bronze tablet on north side of hotel Stoeckle, marked "45"	44.646
Clayton, 1 mile west of; nail in root of wild-cherry tree 50 feet north of Baltimore and Delaware Bay Railroad	38.11
Murphys Mill, 200 feet west of trestle crossing stream from; nail in root of small, pointed wild-cherry tree south side of Baltimore and Delaware Bay Railroad track	42.37
Clayton, 2 miles west of, on Baltimore and Delaware Bay Railroad; nail in root of one of three small chestnut trees 40 feet south of track	45.82
Bingham, 500 feet west of; nail in root of water-oak tree 40 feet north of Baltimore and Delaware Bay Railroad	67.56
Bingham, 1¼ miles west of; nail in root of large water-oak tree 40 feet north of Baltimore and Delaware Bay Railroad track	67.28
Delaneys, ⅜ mile east of; nail in root of spruce-pine tree 30 feet south of Baltimore and Delaware Bay Railroad	72.43
Delaneys, 1⅝ miles west of; nail in root of large white-oak tree 50 feet north of Baltimore and Delaware Bay Railroad	66.45
Massey, 1½ miles east of; nail in root of one of three small wild-cherry trees, 30 feet north of Baltimore and Delaware Bay Railroad track	63.97
Massey brick church, 800 feet east of; nail in root of cedar tree 15 feet north of Baltimore and Delaware Bay Railroad, 150 feet east of crossing of county road	65.10

ELKTON, VIA COWANTOWN, APPLETON, FAIRVIEW, LOMBARD, CALVERT, ZION, BAYVIEW, AND NORTHEAST, TO CHARLESTOWN.

Elkton, Baltimore and Potomac Railroad station; copper bolt in sill of waiting-room door	29.50
Elkton, ¾ mile north of, at bridge over Big Elk Creek; northwest corner of northeast abutment	35.67
Elkton, 2 miles north of, at forks of Newark and Appleton roads; nail in root of maple tree	89.28
Elkton, crossroads, 3¾ miles north of; nail in root of large hickory tree north side of road	163.91
Cowantown, T. J. Scott's store; highest point of stone with twisted iron rod used for hitching post	240.81
Appleton; nail in root of walnut tree northeast corner of crossroads	336.70
Appleton, ¾ mile north of; nail in root of chestnut tree southeast corner of crossroads	324.68
Appleton, 1¼ miles north of; highest point on large flat stone southeast corner of crossroads	344.29
Strayhorns Mills; nail in root of willow tree at northwest corner of wheelwright shop	163.03

	Feet.
Strayhorns Mills, southeast corner of stone wall, foundation of wagon shed; bronze tablet marked "173"	173.273
Strayhorns Mills, 1 mile west of; nail in root of oak tree in schoolhouse yard northwest corner of crossroads	314.60
Fairview, 3 miles east of; top of boundary stone in center of road in front of Mahon's barn	409.86
Fairview, 2½ miles east of; nail in root of maple tree at southeast corner of crossroads	410.22
Fairview, 2 miles east of; nail in root of large poplar tree southeast corner of fork of road	361.47
Fairview, 1½ miles east of; nail in root of three-pronged sycamore tree at fork of road	343.42
Little Elk Creek bridge, 200 feet west of; nail in root of sycamore tree	264.20
Fairview, ½ mile east of; nail in root of sycamore tree, south side of road, 300 feet west of crossroads	381.38
Fairview; nail in root of wild-cherry tree, southwest corner of road forks at	418.29
Fairview, 1 mile west of; nail in root of middle of oak tree with three prongs in triangle of road	462.28
Lombard; nail in root of sycamore, south side of road, in front of wheelwright shop	449.86
Lombard, ½ mile west of; nail in root of large cherry tree, north side of road, 200 feet west of road forks	459.22
Calvert; nail in root of large oak tree, northwest corner of Telegraph and Telephone roads	455.52
Calvert; top of boundary stone in churchyard	441.23
Calvert post-office, John E. Crother's store; bronze tablet in northwest corner, marked "441"	441.180
Calvert, 1½ miles south of; highest point on large bowlder, east side of road	412.09
Zion; nail in root of locust tree, northwest corner of store, southeast corner of crossroads	389.06
Zion, 1 mile south of; highest point of stone in southeast corner of crossroads, by picket fence	361.51
Zion, 1¾ miles south of, at crossroads; nail in root of maple tree, northeast corner	355.81
Bayview, southwest corner of crossroads; foundation of W. L. Jones's boarding house, bronze tablet marked "385"	384.748
Bayview, 300 feet south of crossroads; nail in root of locust tree, east side of road, 20 feet south of entrance to house	383.05
Bayview, 1 mile south of, at north edge of woods; nail in root of large oak tree, east side of road	241.40
Bayview, 1½ miles south of; highest point on boundary stone west side of road	283.89
Northeast, southwest corner of Main street and Cecil avenue; highest point on large bowlder	12.49
Northeast, 1 mile west of; northeast corner of southwest abutment of bridge over small stream	42.60
Northeast, 1½ miles west of; iron bridge over small stream, southwest corner of northeast abutment	16.48
Charlestown, ½ mile north of; northeast corner stone of cattle guards at road crossing of Philadelphia, Wilmington and Baltimore Railroad	33.66
Charlestown station, 50 feet north of; copper plug in northwest corner of northwest corner stone of cattle guards, marked "41"	40.89

BAYVIEW, VIA PLEASANT HILL, TO COWENTOWN, AND FROM PLEASANT HILL NORTH TO APPLETON-FAIRVIEW ROAD.

	Feet.
Bayview, 1 mile east of; nail in root of maple tree northeast corner of crossroads	355.81
Bayview, 1½ miles east of; highest point of large bowlder south side of road	319.13
Bayview, 2½ miles east of, at fork of road; top of guard stone northeast corner of bridge over Little Northeast Creek	237.91
Bayview, 3¼ miles east of; nail in knot of oak tree northeast corner of road	405.04
Pleasant Hill, ¼ mile north of; nail in root of chestnut tree northeast corner of crossroads	400.02
Pleasant Hill; highest point on large stone northwest corner of crossroads	371.72
Pleasant Hill crossroads, ½ mile east of; northeast corner of large stone south side of road by wire fence, 500 feet west of large stone house	347.68
Pleasant Hill, ¾ mile east of; nail in root of large chestnut tree in triangle of road	361.76
Pleasant Hill, 1½ miles east of; nail in root of large oak tree east side of road about 200 feet east of road forks	261.23
Pleasant Hill, 2 miles east of; southeast corner of northwest abutment of bridge over Little Elk Creek	185.03
Pleasant Hill, 2¾ miles east of; large whitewashed stone north side of road about 500 feet east of crossroads	364.57
Big Elk Creek, 350 feet east of county bridge over ; top of stone by large willow tree 50 feet southeast of mill	129.46
Pleasant Hill, ¾ mile north of; nail in root of large cherry tree east side of road	402.51
Pleasant Hill, 1¾ miles north of; top of large stone buried at corner of fence post southwest corner of Telegraph road	339.36

WEST VIRGINIA.

KANAWHA, PUTNAM, LINCOLN, BOONE, LOGAN, MINGO, WYOMING, AND M'DOWELL COUNTIES.

CHARLESTON AND OCEANA QUADRANGLES.

The elevations in the following list are based on a bench mark of the United States Coast and Geodetic Survey in the west monument of St. Albans base. The center of this monument consists of a limestone post projecting 1 foot above the ground, in the top of which is a copper bolt, the elevation of which has been accepted as 594.780 feet above mean sea level. The leveling was done, under the direction of Mr. Hersey Munroe, topographer, by Mr. Hargraves Wood, levelman.

The first line, that from St. Albans via Young's store and Tornado, returning to St. Albans, was run as a closed circuit, and the elevations have been finally adjusted. The remainder of these levels were run in continuous and branch lines without completing closed circuits, the intention being to complete the closure of these lines during the next field season, when the errors will become evident and, if within the allowed limit, will be distributed and adjusted. As here published they are, therefore, but preliminary.

ST. ALBANS, VIA TACKETT CREEK, YOUNG'S STORE, AND TORNADO, TO STARTING POINT.

	Feet.
St. Albans, west base monument, located in fence line on west side of First street, 60 feet north of the north rail of the Chesapeake and Ohio Railway track; center of monument is marked by limestone post projecting 1 foot above ground, in the top of which is a copper bolt, the elevation of which is	594.780
Lewis railroad station, ½ mile east of; nail in root of large walnut tree at bend in lane, 600 feet north of Chesapeake and Ohio Railway	596.99
St. Albans, 1½ miles northwest of; northeast corner of abutment of bridge at first crossing of Tackett Creek	588.07
Tackett Creek, last crossing of; 400 feet west of frame house with well in front; bench mark cut in stone on right side of road	778.07
Tackett Creek, road up; rock on right side just above small spring on left side of road, 500 feet east of summit; "B.M." cut on rock	903.21
Tackett Creek, summit where road leaves and follows Hurricane, 1,000 feet west of; nail in poplar stump at end of small bridge on left side of road.	915.88
Hurricane road, right side of; 75 feet beyond new frame house, about ½ mile west of summit on ledge rock	842.46
Young's store, first house south of on south side of road, belonging to John Hodges; copper bolt, set in east chimney 6 feet from ground, marked "U.S.G.S. 737 Ft. B.M."	737.383
Young's store, west side of road leaving Hurricane road at; nail in root of gum tree 6 inches in diameter, ½ mile south from forks where clearing begins on right	812.58
Young's store, road from, to Bridge Creek; large white oak tree on east side, 200 feet west of head of hollow on south and backbone of ridge..	930.20
Bridge Creek, west bank of; south of and near house on east, about ½ mile south of schoolhouse; nail in small dogwood stump	748.61
Flint Hollow, ½ mile southwest of mouth of; large rock on bank, west side of road and Bridge Creek; cleared field on east, woods on west	700.01
Trace Fork of Mud River, 200 feet below mouth of Twomile Branch, 400 feet northwest of Anderson McAllister's house; copper bolt in huge rock on north side of stream, marked "U.S.G.S. 669 Ft. B.M."	669.214
Twomile Branch (a tributary of Trace Fork of Mud River); large elm tree at mouth of	662.07
Fall Creek, road from; stone on north side, 100 feet from top of first ridge near small walnut	1,033.99
Twomile Branch and Right Fork of Fall Creek; nail in root of large chestnut tree on south side of road near first break in ascent of ridge between streams	879.65
Tornado, 2 miles southwest of, on Fall Creek Road; nail in root of beech tree on bank near new house	620.21
Tornado, 1½ miles southwest of, on road up Fall Creek; iron post on south side of road, 150 feet above first crossing of Fall Creek, marked "614".	613.797
Tornado, mill at; large stone in retaining wall of mill at point where wall meets fence	607.29

GARRETT'S BEND TO SAND GAP, SUGAR CAMP KNOB, DOWN LAUREL FORK OF HORSE CREEK TO MADISON.

Garrett's Bend, 1 mile southeast of, up Trace Fork; nail in root of sycamore tree, east side of road, near foot-log and sawmill	670.49
Garrett's Bend, south end of first foot-log at, going up Trace Fork; nail in stump	681.42
Garrett's Bend, 2 miles above; nail in root of walnut tree at barn and crossing of William's branch	703.27

	Feet.
Sand Gap, nail in large stump under chestnut tree west side of road......	1,088.33
Sand Gap, 500 feet west of fork of roads at; copper bolt, in huge rock above John A. Midkiff's house; marked "U.S.G.S. 1079 B.M.".........	1,078.717
Brushy Knob, east end of, on road to Little Coal River; nail in root of white oak tree on west side of road	1,223.07
Sugar Camp Knob signal, ¼ mile south of cabin near, 125 feet below fork of road; nail in root of hickory tree on west side of road..............	1,197.62
Sugar Camp Knob signal, 1½ miles from, on Laurel Fork; nail in root of beech tree at schoolhouse on west side of road........................	839.11
Laurel Fork, 1½ miles above mouth of; nail in root of beech tree on east side of road..	753.95
Laurel Fork, ¼ mile above mouth of; nail in root of beech tree on west side of road..	706.31
Laurel Fork, 200 feet above confluence with Horse Creek; copper bolt in rock ledge on east bank, opposite James McClure's house near last crossing of Laurel; marked "U.S.G.S. 673 Ft. B.M."	672.884
Hill, 1 mile above; nail in root of leaning beech tree on north bank of Horse Creek, about 1,200 feet below Price's house, just below small stream coming in on right..	652.26
Trace Branch, 1 mile above mouth; copper bolt in large bowlder on left side of right-hand hollow on Trace Branch of Horse Creek; marked "U.S.G.S. 766 Ft. B.M."	766.205
Hill; top of foundation wall north side of store	668.85
Hill, ford of Coal River, 1½ miles south of; nail in root of large white oak tree on west side of road, ½ mile south of ford	657.90
Camp Creek, ¼ mile north of; nail in root of large sugar maple tree on west side of road 300 feet above Stolling's house........................	662.83
Camp Creek, ¼ mile north of; copper bolt in small ledge of rock on east side of road going up Little Coal River, 300 feet above B. Stolling's; marked "U.S.G.S. 660 Ft. B.M."	660.48
Camp Creek, ¾ mile south of opposite Doc. Hill's house; nail in root of large beech tree west side of road	670.10
Camp Creek, 2 miles south of; nail in root of beech tree west side of road.	711.04
Lick Creek, 1 mile north of; 600 feet above house where road forks to left; nail in root of hollow beech tree on bank of river west side of road	671.35
Lick Creek, opposite mouth of; nail in root of one of two sycamore trees overhanging river...	667.61
Lick Creek, 1½ miles south of mouth of; nail in root of leaning beech tree on south side of Lick Creek, below small stream coming in on south....	717.21
Lick Creek, 500 feet below sawmill on; nail in root of leaning beech tree on north side of road...	743.50
Lick Creek, 3 miles above mouth, at Chambers's house; nail in root of walnut tree in field on north side of road.............................	767.75
Lick Creek, 3½ miles above mouth of, and ½ mile above Chambers's house, on Right Fork of Lick Creek; copper bolt in bowlder above coal bank 25 feet east of creek, between two walnut trees, one of which is blazed; bolt is marked "U.S.G.S. 820 Ft. B.M."................................	819.747
Newport (Danville post-office), ½ mile above; nail in root of large elm tree on south side of road..	678.49

MADISON, UP SPRUCE FORK TO SENG POST-OFFICE.

Madison, sheriff's office; bronze tablet in front wall, marked "704"......	703.649
Spruce Fork, 600 feet above mouth of; nail in root of beech tree on east side of road..	699.18
Madison, 1½ miles south of; nail in root of white pine tree on east side of road up Spruce Fork, 225 feet above schoolhouse.......................	709.20

	Feet.
Low Gap Branch, 450 feet above mouth; ledge of rock on north side of road	719.15
Spruce Fork, ½ mile below Hunters Branch; nail in root of large, leaning sycamore tree on west side of road, bank of Spruce Fork 5 feet above water	727.67
Spruce Fork, ½ mile above Hunters Branch; nail in root of apple tree 600 feet above log house on east side of road	745.75
Spruce Fork, 4 miles below Hewett Creek; nail in root of large sycamore tree 200 feet above schoolhouse	744.20
Spruce Fork, 1 mile below mouth of Hewett Creek; nail in root of elm tree on east side of road	764.55
Spruce Fork, 200 feet below mouth of Hewett Creek; nail in root of sycamore tree on east side of road in front of schoolhouse	769.57
Spruce Fork, mouth of Dry Branch, near John French Stollings; nail in root of oak tree on west side of road	785.32
Spruce Fork, ¼ mile below mouth of Rockhouse Creek; nail in root of water-birch tree on south side of road 200 feet above crossing	816.01
Spruce Fork, ¾ mile above Rockhouse Creek; nail in root of sycamore tree on east side of road 400 feet above cabin on right	828.09
Spruce Fork, ½ mile above mouth of Beech Creek on north side of Spruce Fork, 300 feet below splash dam opposite William Coleman's barn; copper bolt in ledge of rock, marked "U.S.G.S. 846 Ft. B.M."	845.661

FROM MOUTH OF HEWETT CREEK TO PECK AND UP GUYANDOT RIVER TO LOGAN.

Hewett Creek, 300 feet above mouth of; copper bolt in ledge of rock opposite schoolhouse and on south side of creek; marked "U.S.G.S. 767 Ft. B.M."	767.382
Hewett Creek, 1 mile above mouth of; on south side of road 300 feet below French McNealy's; nail in root of leaning beech tree	791.76
Hewett, 1 mile above post-office; nail in root of elm tree on east side of road 1,000 feet below splash dam	828.12
Hewett, 2 miles above post-office; 600 feet below Robert Hardessy's; nail in root of small leaning birch tree on south side of road	855.56
Hewett Forks, 1½ miles below; nail in root of leaning beech tree on west side of road in front of schoolhouse	904.63
Hewett Forks, ½ mile above; rock in road near ledge on right with coal under it	1,003.94
Hewett and Big creeks, top of ridge between; nail in root of mulberry tree 600 feet below top of ridge on Big Creek side	1,166.46
Big Creek, head of; nail in root of chestnut tree on east side of road above Sanders's barnyard	982.60
Mill Creek, head of; nail in root of walnut tree on north side of road above bend at house near foot of mountain	973.54
Peck, ¼ mile south of post-office; on the northwest side of Mill Creek 300 feet above mouth; copper bolt in northwest corner of huge bowlder, marked "U.S.G.S. 653 Ft. B.M."	652.88
Peck, 1 mile above on Guyandot River; nail in root of beech tree on west side of road	698.79
White's Mill, ½ mile south of; nail in root of large elm tree on west side of road along Guyandot River, 200 feet below schoolhouse	645.42
Logan, 1½ miles south of; nail in root of huge sycamore tree on west side of road	652.26
Logan, 2 miles south of; 500 feet above Hamilton McDonald's; nail in root of beech tree on right of road	654.62
Logan, bronze tablet set in wall at northeast corner of court-house, marked "678"	678.108

LOGAN TO MOUTH OF BIG HUFF CREEK AND UP GUYANDOT RIVER TO GILBERT.

	Feet.
Logan, 1 mile east of; on road up Guyandot River; large bowlder marked "B.M.," south side of road	668.23
Dingess Run, 200 feet south of; nail in root of large sycamore tree west of road	662.88
Andrew Perry's house, ¼ mile above, on west side of road; nail in root of leaning water birch	674.59
Ely Gore's, across river from and 500 feet above hollow on left; nail in root of leaning sycamore tree on west side of road	685.69
Rum Creek schoolhouse, ¼ mile above; rock at root of large cucumber tree on west side of road	687.99
Floyd Buchanan's, top of hill across river from; lower projection on vertical ledge of rock on east side of road	773.03
Hugh Avis's, ½ mile above; nail in root of beech tree on west side of road.	713.05
Rich Creek, opposite mouth of; copper bolt in rock 20 feet north of Methodist Episcopal Church, marked "U.S.G.S. 725 Ft. B.M."	724.78
Rich Creek, 1 mile above; rock on right of road, near Melros White's	722.22
Henry Branch, ½ mile above; nail in root of walnut tree on east side of road	756.04
George McDonald's field, cedar tree in, 1,500 feet below his house on the south side of Guyandot River (B. M. 724.465 of N. & W. R. R.); nail in root	730.16
Buffalo Creek, opposite mouth of; nail in root of sycamore tree on south side of Guyandot River, near water's edge	722.28
Buffalo Creek, ¼ mile above mouth of, opposite Martin Doss's and 60 feet above foot-log, on west side of Buffalo; copper bolt in rock, marked "U.S.G.S. 728 Ft. B.M."	727.704
Buffalo Creek, 2 miles above mouth of; nail in root of sycamore tree on east side of road	784.21
Buffalo Creek, west side of valley, 3 miles above mouth of; copper bolt, marked "U.S.G.S. 808 Ft. B.M."	807.732
Rockhouse Creek, west side of and 1 mile above mouth; copper bolt in rock near south end of cliff; marked "U.S.G.S. 792 Ft. B.M."	791.942
Big Huff Creek, east side of and 300 feet above mouth; copper bolt in rock, marked "U.S.G.S. 727 Ft. B.M."	727.148
Guyandot River, ½ mile above mouth of Rockhouse Creek; nail in root of small black oak on west side of road	736.88
Guyandot River, 200 feet above Wayne McDonald's store; nail in root of small sycamore tree, west side of road	759.33
Henderson Browning's, ¼ mile below; nail in root of large white oak on south side of road	751.35
Elk Creek, 600 feet below; nail in root of beech tree on west side of road, 300 feet below Emory Altizer's	753.53
Spice Creek, ½ mile above; nail in root of white-walnut tree on north side of road, 1 mile below Jim Justice's	770.21
Guyandot River; large rock on bank of, west side, where road comes near water, ½ mile above Jim Justice's	755.77
Gilbert, 1 mile below; nail in root of sycamore tree with spreading roots 200 feet above old mill race where wagon road crosses river	803.58
Gilbert, ½ mile below; rock on west side of road 200 feet above high cliff on left	821.61

GILBERT, VIA WHARNCLIFFE, TO STATE CORNER BETWEEN VIRGINIA, WEST VIRGINIA, AND KENTUCKY.

Gilbert, opposite Alexander Stafford's store; iron post in field marked "832"	831.757

	Feet.
Gilbert, rock on east side of road near top of hill above Stafford's store...	853.94
Gilbert Creek, 1 mile above mouth of; rock marked "B.M." in creek and road at first crossing above Zat Ellis's house	847.23
Gilbert Creek, ½ mile above Horsepen Creek; nail in root of beech tree on east side of road 600 feet below Scott Bliss's	890.67
Twisted Gun Gap Branch, 800 feet below; nail in root of poplar tree on east side of road up Gilbert Creek	944.57
Twisted Gun Gap, summit of; nail in root of oak tree on east side of road.	1,442.67
Ben Creek, head of right fork below deserted cabin; rock on east side of road near rock cut at foot of mountain	1,199.68
Ben Creek, 400 feet below Laurel Branch; nail in root of small white-pine on east side of road	1,016.54
Ben Creek, 300 feet below Laurel Branch, 4 miles above Wharncliffe; iron post on east side of road, opposite T. E. Brown's house, marked "1020".	1,019.93
Ben Creek, 400 feet below Pound Mill Branch; nail in root of small sycamore tree on east side of road	948.27
Ben Creek, 200 feet above Spring Fork Branch; at Michael Hatfield's; nail in root of black-oak tree in west side of road	889.42
Wharncliffe, railroad bridge over Ben Creek; bridge seat of east abutment (B. M. 820.39 of N. & W. R. R.)	822.08
Kentucky, Virginia, and West Virginia, corner of State lines, ½ mile south of Wharncliffe; iron post, marked "825"	825.273

KENTUCKY, VIRGINIA, AND WEST VIRGINIA CORNER, VIA MOUTH OF LONG POLE UP SAME, TO NEAR OAK BRANCH.

Long Pole Creek, 1½ miles above mouth of; nail in root of beech tree on north side of road	975.38
Long Pole Creek, 1,200 feet below Oak Branch; iron post on south side of road, marked "1050"	1,050.395

UP BIG HUFF CREEK, VIA CYCLONE, TO ITS HEAD AND TO ECHART.

Millard McDonald's, 600 feet below; nail in root of poplar tree on south side of road	770.38
Big Spring Branch, 1,800 feet above crossing of; nail in root of sycamore tree on north side of road	792.69
Cyclone, copper bolt in rock opposite Henchman's house, marked "U.S.G.S. 854 Ft. B.M."	854.089
Ed. Cook's, ½ mile above; nail in root of beech tree on south side of road	896.34
Lem Brown's, ½ mile above; nail in root of beech tree on south side of road	948.65
Lem Brown's, nail in root of poplar tree on south side of road at	993.08
Toney Fork of Huff Creek, south side of, about 2 miles above mouth; copper bolt in ledge of rock, marked "U.S.G.S. 1234 Ft. B.M."	1,234.552
Road Gap Branch, 600 feet below; iron post on east side of road up Big Huff Creek, 100 feet above D. H. Cook's store, marked "1068'.'	1,067.649
Rockhouse Branch, 600 feet above at Gordon Burgess's; nail in root of sycamore tree on east side of road up Big Huff Creek	1,149.01
Road fork, 1 mile above; nail in root of tall sycamore tree 50 feet to right of road up Big Huff Creek	1,219.66
Road fork, 2 miles above; nail in root of water-birch on north side of road up Big Huff Creek	1,273.72
Trace fork, 600 feet above; nail in root of tall sycamore tree on west side of road up Big Huff Creek	1,374.48
Brushy Fork, 100 feet above mouth of, opposite W. R. Blankenship's; nail in root of sycamore tree east side of Big Huff Creek	1,482.66

	Feet.
Laurel Branch, ¼ mile above and a little below Garden Branch on east side of Big Huff about 600 feet below Bailey's; nail in root of sycamore tree, east side of road	1,605.51
Spring Branch, 1,000 feet above mouth; nail in root of beech tree with top off, on west side	1,815.06
Spring Branch; nail in root of sugar maple halfway up mountain above head of stream, toward lowest part of ridge	2,346.70
Spring Branch and Alum Dirt Branch, top of ridge between; nail in root of large water-oak, 200 yards east of Joe Lusk's deserted house	2,771.43
Alum Dirt Branch, ⅓ way down mountain toward; nail in root of buckeye tree	2,428.85
Echart, east bank of Pond Fork of Coal River opposite mouth of Skin Fork; copper bolt, in ledge of rock, marked "U.S.G.S. 1423 Ft. B.M."	1,422.559

ECHART DOWN POND FORK OF LITTLE COAL RIVER, VIA BALD KNOB AND CROOK, TO MOUTH OF WEST FORK AND UP SAME TO MOUTH OF BROWNS BRANCH.

Pond Fork, 1 mile below Skin Fork; nail in root of sycamore tree on east side of road	1,352.47
Skin Fork, 3 miles below; nail in root of leaning sycamore tree on east side of road down Pond Fork	1,240.51
Rock Lick Branch, ¼ mile below mouth of; nail in root of sycamore tree on east side of road down Pond Fork	1,141.84
Bald Knob, east side of valley at; copper bolt in bowlder opposite Eddy Workman's, marked "U.S.G.S. 1101 Ft. B.M."	1,100.534
Hatfield's store, 1 mile above; nail in root of sycamore tree on west side of road, 100 feet above branch	1,030.47
Cow Creek, north side of, ¾ mile from mouth and 800 feet from Jim Gunnoe's; copper bolt, in ledge of rock, marked "U.S.G.S. 1039 Ft. B.M."	1,038.555
Hatfield's store, 2 miles below, on west side of Pond Fork and 800 feet above Dick Gerald's; nail in root of leaning sycamore tree east side of road	934.10
White's store, ¼ mile above; nail in root of elm tree with sycamore growing out of it, on east side of Pond Fork	892.87
Crook, first crossing of Pond Fork above; nail in root of sycamore tree on west side of road	847.64
West Fork of Pond, 1,000 feet above junction of Pond Fork; copper bolt in rock, northeast side, marked "U.S.G.S. 808 Ft. B.M."	808.396
West Fork of Pond, ½ mile below Brown's Branch; nail in root of sycamore tree on west side of road, 600 feet below John Giles's	862.76
West Fork of Pond, 800 feet below Brown's Branch; copper bolt in ledge of rock on west side of road a little above and nearly opposite small water mill; bolt is marked "U.S.G.S. 884 Ft. B.M."	883.709

JUNCTION OF WEST AND POND FORKS OF LITTLE COAL RIVER TO MADISON.

Bull Creek, 300 feet above mouth; nail in root of leaning water birch on west side of road down Pond Fork	773.17
Robinson Creek, ½ mile above, and 150 feet above Gusser Gore; nail in root of pine tree right side of road down Pond Fork	760.24
Robinson Creek and Pond Fork, 500 feet from confluence of; copper bolt sunk in protruding bowlder in Ballard Brown's field on east side of and 300 feet from road, marked "U.S.G.S. 746 Ft. B.M."	746.167
Robinson Creek, 1 mile below; nail in root of sycamore tree on north bank of Pond Fork and on south side of road just above schoolhouse	721.67

	Feet.
David Green Branch, 700 feet below on west side of road; nail in root of beech tree with top off, and on east bank of Pond Fork	719.94
Workman Branch, 200 feet above; nail in root of chestnut-oak tree on west side of road down Pond Fork	700.76

SCOTT RAILROAD STATION.

Scott railroad station, 75 feet south of; iron post in Pine's orchard, 50 feet south of Chesapeake and Ohio Railway tracks, marked "693"	692.945

NORTH CAROLINA.

Precise Level Line.

MOREHEAD CITY, VIA SALISBURY AND ASHEVILLE, TO PAINT ROCK.

The elevations in the following list are based on a bronze tablet in Morehead City, in the southeast corner of brick house owned by George Dees, the tablet being marked "17," its elevation being 17.763 feet, as determined from the tide-gage established on the pier of the Atlantic and North Carolina Railroad at Morehead depot.

The leveling was done by Mr. W. Carvel Hall, topographer, assisted by two rodmen, Messrs. H. W. Durham and W. H. Ford for a part of the season and Messrs. Hargraves Wood and L. T. Haney for the remainder of the time. There were also attached to the party a traverseman and general assistant, Mr. C. F. Horton, and umbrella and instrument bearer and two laborers.

ATLANTIC AND NORTH CAROLINA RAILROAD.

MOREHEAD CITY TO NEWBERN.

	Feet.
Morehead depot, 8.3 feet east of; top of United States Geological Survey iron bench-mark post, 5.6 feet north of north rail of Atlantic and North Carolina Railroad, 96.9 feet west of said railroad company's bulkhead of wharf; stamped "7"	7.763
Morehead City, northwest corner of Eighth and Arendal streets; southeast corner of brick house owned by George Dees; bronze tablet, marked "17"	17.763
Morehead City station; top of rail opposite	12.96
Hollywood; top of north rail at center of 2-foot open culvert	21.60
Atlantic; top of north rail at road crossing at station	19.57
Atlantic, 1.92 miles west of; 23 feet south of north rail at southwest corner of M. D. Oglesby's freight platform; United States Geological Survey iron bench-mark post, marked "18"	19.354
Wildwood; top of north rail of main track opposite milepost G 87 M 8	20.03
Newport; southwest corner of Middle and Railroad streets; cut on 14-inch elm tree	18.76
Newport; top of north rail of main track opposite ticket office	19.57
Newport, 2.31 miles west of; 25 feet south of north rail in line with telegraph poles; United States Geological Survey iron bench-mark post, marked "28"	29.043
East Creek culvert; railroad spike in south parapet between archways	21.06
Havelock; top of north rail main track opposite ticket office	24.02
Slocum Creek bridge; railroad spike in east abutment (near north end)	10.455

	Feet.
Havelock, 1.74 miles west of; 26 feet south of north rail, in line with telegraph poles; United States Geological Survey iron bench-mark post, marked "26"	27.382
Pine Grove, 0.07 mile west of; railroad spike in north parapet between arches of culvert	22.69
Croatan; top of north rail opposite station	30.09
Riverdale; 5 feet north of north rail at mail catcher; United States Geological Survey iron bench-mark post, marked "25"	25.801
Milepost G 64 M 31, 0.27 mile west of; railroad spike in top of south parapet over center of 6-foot arch culvert	15.39
Scott Creek trestle; 2 feet from north end of west abutment; bronze tablet, marked "7"	7.888
Newbern, northwest corner of Broad and Craven streets; corner stone at northeast corner of Craven County court-house; bronze tablet, marked "16"	15.673
Newbern, corner of Queen and Hancock streets; top of north rail of main track of Atlantic and North Carolina Railroad at intersection with west rail of Wilmington, Newbern and Norfolk Railway	12.63

NEWBERN TO KINSTON.

	Feet.
Milepost G 54 M 41, 0.73 mile west of; 30 feet south of north rail, in line with telegraph poles; United States Geological Survey iron post, marked "27"	27.334
Clark; top of north rail at road crossing at station	32.03
Tuscarora; top of north rail at road crossing at station	39.92
Tuscarora, 1.14 miles west of; 30 feet south of north rail, in line with telegraph poles; United States Geological Survey iron post, marked "51"	50.674
Core Creek; 75 feet south of north rail, 4 feet northeast of the northeast corner of L. F. Taylor's store, on the west side of Trenton road; United States Geological Survey iron bench-mark post, marked "48"	47.621
Dover; 19 feet east of main crossroad and 77 feet south of north rail; United States Geological Survey iron bench-mark post, marked "64"	63.653
Caswell; top of north rail at road crossing at station	46.36
Neuse River bridge; railroad spike in southwest corner of east abutment.	27.42
Kinston, 0.51 mile east of; top of north rail of Atlantic and North Carolina Railroad at intersection with west rail of Wilmington and Weldon Division of Atlantic Coast Line	42.21
Kinston; north rail of main track opposite station	45.85

KINSTON TO GOLDSBORO.

	Feet.
Kinston; Lenoir County court-house, north face of northwest corner of portico on west end of building; bronze tablet, marked "48"	48.179
Falling Creek; 31 feet south of north rail of main track on west side of road; United States Geological Survey iron bench-mark post, marked "55"	55.231
Lagrange; 31 feet south of north rail of main track, at southeast corner of ticket office; United States Geological Survey iron bench-mark post, marked "109"	109.207
Bests; top of north rail opposite station	121.99
Bests, 4.18 miles west of; 30 feet west of county road and 30 feet south of north rail, in line with telegraph poles; United States Geological Survey iron bench-mark post, marked "120"	119.593
Goldsboro; Wayne County court-house, northwest corner of; bronze tablet, marked "111"	110.991
Goldsboro; top of north rail of northernmost track opposite union ticket office	109.50

SOUTHERN RAILWAY.

GOLDSBORO TO RALEIGH.

	Feet.
Little River bridge; railroad spike in west face of south parapet of east abutment	75.35
Asylum; top of north rail at station	74.90
Rose; United States Geological Survey iron bench-mark post, in line with telegraph poles, marked "136"	135.859
Atlantic Coast Line Railroad, Smithfield Branch, west rail; top of north rail of Southern Railway at junction	147.61
Princeton, 23.2 feet north of north rail of main track, at east side of platform; United States Geological Survey iron bench-mark post, marked "152"	151.959
Pine Level; top of north rail opposite ticket office	169.21
Selma; top of north rail, Southern Railway track, at junction with west rail of Atlantic Coast Line Railroad track	176.47
Selma; 158 feet south of north rail of main track of Southern Railway, 128 feet west of west building-line of Webb street, near east end of one-story brick store occupied by N. B. Snipe & Bro.; United States Geological Survey bronze tablet, marked "178"	178.131
Neuse River bridge; railroad spike in face of east back wall near south end	134.94
Wilsons Mills; in coping over west edge of opening at north end of 3 by 3 foot box culvert; United States Geological Survey copper bolt, marked "U.S.G.S. 229 Ft. B.M."	229.218
Clayton; 162 feet south of north rail of main track; W. H. McCullers, sr., & Son brick store; United States Geological Survey bronze tablet near the east corner in the front, marked "346"	345.638
Clayton, 2.95 miles west of; top of northeast corner of granite wall around cemetery, 20 feet south of north rail	366.88
Auburn, 1.37 miles east of; copper tack in root of 3-foot water-oak tree 35 feet north of north rail	328.13
Auburn; top of north rail of main track at station	336.37
Garner; 25 feet north of north rail of main track and 12 feet west of southwest corner of ticket office; United States Geological Survey iron bench-mark post, marked "384"	383.521
Raleigh, North Carolina State capitol; corner stone; bronze tablet, marked "363"	363.277

RALEIGH TO DURHAM.

Raleigh, Union Station; top of north rail of north track (spur track) 3 feet from edge of platform	316.79
Caraleigh Junction; top of north rail at switch point	355.82
Method; top of north rail opposite station	446.53
Cary, Seaboard Air Line crossing near; top of north rail of Southern Railway at intersection with north rail of Seaboard Air Line	496.77
Cary; top of north rail of main track at station	496.12
Cary; 22 feet south of north rail of main track and 3 feet east of northeast corner of station; United States Geological Survey iron bench-mark post, marked "497"	496.588
Morrisville; top of north rail of main track opposite station	300.70
Morrisville, 0.59 mile west of; 33.6 feet south of north rail and 26.8 feet east of a 6-inch hickory tree; United States Geological Survey iron bench-mark post, marked "321"	321.271
Nelson; top of north rail of main track opposite station (private warehouse)	403.24

	Feet.
Nelson, 2.06 miles west of; stone over north end of 3 by 3 foot box culvert; copper bolt in top, marked "U.S.G.S. 360 Ft. B.M."	359.974
Brassfield; top of north rail of main track opposite station	376.22
East Durham; top of north rail of main track opposite station	408.37
Durham, Durham County court-house, west side of Main street entrance; United States Geological Survey bronze tablet, marked "406"	406.043

DURHAM TO GREENSBORO.

University; top of north rail of main track at station	470.75
University; 1.5 feet north of northwest corner of station; iron post, marked "471"	471.42
Robson; west rail of main track at road crossing	485.66
Robson, 2.46 miles south of; 23 feet east of west rail and 2 feet south of signpost at road crossing; United States Geological Survey iron bench-mark post, marked "549"	549.279
Chapel Hill, University of North Carolina, "Memorial Hall," stone tablet north side of; bronze tablet set therein, marked "503"	502.663
Oconeechee; top of north rail at switch point	569.17
Hillsboro, northwest corner of Orange County court-house; bronze tablet, marked "543"	543.384
Efland; top of north rail of main track opposite milepost No. 37	663.05
Efland, 0.17 mile west of station; 32 feet north of north rail in line with telegraph poles; United States Geological Survey iron bench-mark post, marked "667"	666.763
Mebane, 28.4 feet south of north rail of main track at northeast corner of station; United States Geological Survey iron bench-mark post, marked "678"	677.743
Mebane; top of north rail main track opposite station	676.91
Haw River; top of north rail of main track opposite station	536.37
Graham, Alamance County court-house, north front of, 2 feet west of main doorway; bronze tablet, marked "642"	641.972
Graham; top of north rail of main track opposite station	655.93
Burlington; railroad spike in southwest corner of old brick engine house, 4 feet north of north rail of original main track	663.08
Burlington; top of north rail of original main track opposite station	663.22
Elon College; top of north rail of main track at road crossing	716.69
Gibsonville, 25.7 feet north of rail of main track at southeast corner of ticket office; United States Geological Survey iron bench-mark post, marked "721"	720.835
McLeansville; 95 feet south of north rail of main track, near northwest corner of small store; United States Geological Survey iron bench-mark post, marked "744"	744.259
Greensboro; top of north rail of old North Carolina Railroad main track opposite ticket office	836.59
Greensboro, northwest corner of Federal court-house and post-office; bronze tablet, marked "839"	839.455

GREENSBORO TO SALISBURY.

Pomona; top of west rail of main line track opposite station	869.34
Pomona, 1.5 miles south of; copper bolt, 2 feet from east end of north back wall of bridge No. 290.7, marked "U.S.G.S. 813 Ft. B.M."	813.167
Jamestown; top of west rail of main track opposite station	776.00
Jamestown; 182 feet east of west rail of main track, 185 feet south of depot; copper bolt in large bowlder, marked "U.S.G.S. 793 Ft. B.M."	793.246

	Feet.
High Point, J. R. Flagg's drug store; east corner of brick front, 99 feet west of west rail of main track; bronze tablet, marked "940"	939.789
High Point; top of west rail of main track opposite station	936.56
Thomasville; 28 feet east of west rail of main track at southwest corner of ticket office; United States Geological Survey iron bench-mark post, marked "852"	851.753
Conrads, 1.04 miles west of; coping of east end of north back wall of bridge over Rich Fork, No. 315.9; copper bolt, marked "U.S.G.S. 665 Ft. B.M."	665.175
Lexington, southeast corner of Davidson County court-house; bronze tablet, marked "811"	810.461
Linwood; top of west rail of main track opposite station	658.32
Linwood, 0.72 miles south of; coping at east end of south abutment of bridge No. 326.4; copper bolt, marked "U.S.G.S. 630 Ft. B.M."	630.186
Holtsburg; top of west rail of main track at road crossing at station	631.41
Salisbury; top of west rail of main line main track opposite station	749.94
Salisbury, southwest corner of Rowan County court-house; bronze tablet, marked "765"	765.103

SALISBURY TO NEWTON.

Majolica; top of north rail of main track opposite station	746.26
Majolica, 3.72 miles west of, at Second Creek bridge; southeast corner of southeast pedestal block; copper bolt, marked "U.S.G.S. 671 Ft. B.M."	670.549
Cleveland; 20 feet north of north rail of main track at southwest corner of station; United States Geological Survey iron bench-mark post, marked "790"	789.633
Elmwood; 34.5 feet south of north rail of main track at northeast corner of station; iron bench-mark post, marked "838"	837.548
Statesville; top of north rail of main track opposite station	922.68
Statesville; Iredell County court-house, southeast corner; bronze tablet, marked "926"	925.835
Plotts, 0.15 mile west of station; coping at southeast end of north abutment of bridge; copper bolt, marked "U.S.G.S. 776 Ft. B.M."	776.092
Catawba; J. U. Long & Co.'s store; brickwork near north corner of east front, 437 feet south of north rail of main track; bronze tablet, marked "873"	872.914
Catawba; top of north rail main track opposite station	833.46
Claremont; 29.5 feet south of north rail of main track, at northeast corner of station; United States Geological Survey iron bench-mark post, marked "U.S.G.S. 970 Ft. B.M."	969.596
Claremont; top of north rail of main track opposite station	968.00
Newton, Catawba County court-house, west end of north portico; bronze tablet, marked "996"	995.832

NEWTON TO MARION.

Newton; top of north rail of main track opposite station	1,016.98
Conover; top of north rail of main track at road crossing at station	1,060.36
Hickory; top of north rail of main track opposite station	1,164.60
Hickory, 148.8 feet north of north rail of main track, northeast corner of First National Bank Building; bronze tablet, marked "1164"	1,164.119
Hildebrand; top of north rail of main track at road crossing at station	1,149.01
Hildebrand, 0.91 mile west of, 3 feet from east end of coping, north end of culvert; copper bolt, marked "U.S.G.S. 1087 Ft. B.M."	1,086.691
Connellys Springs; top of north rail of main track opposite station	1,195.07

	Feet.
Connellys Springs, 142.4 feet north of north rail of main track, James Hudson's brick store, south front near east corner; bronze tablet, marked "1193"	1,192.806
Valdese; top of north rail of main track opposite station	1,203.30
Drexel, 15 feet north of north rail of main track, 0.14 miles east of mile-post 74; United States Geological Survey iron bench-mark post, marked "1193"	1,192.678
Morganton; top of north rail of main track opposite station	1,111.21
Morganton, Burke County court-house, extreme northwest corner of north portico; bronze tablet, marked "1182"	1,181.829
Calvin; top of north rail of main track opposite station	1,060.53
Glen Alpine, 73.2 feet north of north rail of main track; southeast corner of brick basement of Hennessee & Co.'s store; bronze tablet, marked "1215"	1,215.005
Glen Alpine; top of north rail of main track opposite station	1,210.63
Bridgewater, 0.4 mile east of; bridge seat at west end of Muddy Creek bridge, 2¾ feet south of south rail; copper bolt, marked "U.S.G.S. 1091 Ft. B.M."	1,090.615
Bridgewater; top of north rail of main track opposite station	1,096.77
Nebo, 134.2 feet north of north rail of main track; bronze tablet, in south basement wall 1 foot from east front of J. D. Pitt's store, marked "1298"	1,297.681
Nebo; top of north rail of main track opposite station	1,283.63
Marion, McDowell County court-house, west face at south end of portico; bronze tablet, marked "1438"	1,437.934

MARION TO ASHEVILLE.

Marion; top of north rail of main track opposite station	1,391.69
Greenlee, 11.7 feet south of north rail of main track, at east end of platform; United States Geological Survey iron bench-mark post, marked "1286"	1,285.516
Old Fort, 40.7 feet north of north rail of main track, at southwest corner of ticket office; United States Geological Survey iron bench-mark post, marked "1437"	1,437.183
Dendron; top of north rail of main track opposite station	1,752.79
Round Knob, 9 feet south of north rail and 46.1 feet east of entrance to Round Knob Hotel; bronze tablet, set in face of solid rock, marked "1829"	1,829.269
Mud Cut, 14.2 feet south of north rail of main track and 293 feet east of switch point; United States Geological Survey iron bench-mark post, marked "2153"	2,152.671
Swannanoa Tunnel, north side-wall of, 2.6 feet east of west portal; bronze tablet, marked "2522"	2,521.771
Terrell; top of north rail of main track opposite station	2,525.28
Black Mountain; top of north rail of main track opposite station	2,366.71
Swannanoa, 50.6 feet south of north rail of main track, on west side of ticket office; United States Geological Survey iron bench-mark post, marked "2222"	2,221.50
Azalea, 12.75 feet south of north rail of main track, 59.75 feet west of switch point, in face of rock; bronze tablet, marked "2057"	2,057.079
Biltmore; top of north rail main track Salisbury Branch, opposite station	1,993.24
Biltmore, office of the Biltmore Estate; northwest pillar of porte-cochère; bronze tablet, set in bottom stone, marked "1996"	1,995.554
Asheville, 19.3 feet north of north rail, 505 feet east of milepost 141, in pedestal block of northeast corner post of train shed; bronze tablet, marked "1986"	1,985.650

ASHEVILLE TO PAINT ROCK.

	Feet.
Asheville; top of north rail of passenger track opposite station	1,985.19
Montford; top of north rail of main track opposite station	1,969.32
Olivette, 1.13 miles east of; 40.8 feet north of north rail of main track, 400 east of water-tank, in a bowlder containing 50 cubic yards; copper bolt, marked "U.S.G.S. 1924 Ft. B.M."	1,924.069
Olivette; top of north rail of main track opposite station	1,896.03
Alexandria; top of north rail of main track opposite station	1,792.07
Alexandria, 310 feet west of station, 11.1 feet south of north rail of main track, east side of road crossing; copper bolt, marked "U.S.G.S. 1796 Ft. B.M."	1,795.668
Baileys; top of north rail of main track opposite station	1,728.38
Baileys, 0.97 mile west of station, 11.5 feet south of main track, 19 feet east of milepost 158; copper bolt in top of solid rock, marked "U.S.G.S. 1729 Ft. B.M."	1,729.335
Rollins; top of north rail of main track opposite station	1,669.30
Marshall; top of north rail of main track opposite station	1,645.02
Marshall, Madison County court-house, southeast corner; bronze tablet, marked "1646"	1,646.336
Barnard; top of north rail of main track opposite station	1,532.76
Barnard, 0.19 mile west of station; 140 feet west of milepost 171, and 6.5 feet north of north rail of main track, in solid rock; copper bolt, marked "U.S.G.S. 1529 Ft. B.M."	1,529.551
Sandy Bottom; top of north rail of main track opposite station	1,462.63
Stackhouse; top of north rail opposite station	1,418.82
Hot Springs, southeast corner of east abutment of Spring Creek bridge; copper bolt, marked "U.S.G.S. 1326 Ft. B.M."	1,326.185
Paint Rock, north end of west abutment of Grass Creek bridge; bronze tablet, marked "1259"	1,258.617
Paint Rock; top of north rail opposite station	1,266.77

NORTH CAROLINA AND SOUTH CAROLINA.

BUNCOMBE, HENDERSON, AND TRANSYLVANIA COUNTIES, NORTH CAROLINA, AND PICKENS AND GREENVILLE COUNTIES, SOUTH CAROLINA.

ASHEVILLE AND PISGAH QUADRANGLES.

The elevations in the following list are based upon a bronze tablet set in the bottom stone of arch at rear or east side of office of the Biltmore Estate, at Biltmore, and marked "U. S. Geological Survey. 1,996 feet. B. M." The elevation of this bench mark was originally accepted as 2,005 feet (and it was so stamped), as determined from the best obtainable adjustment of railway levels to the top of rail in front of Biltmore station. All of the bench marks herein described were marked in accordance with this elevation and are, therefore, stamped approximately 9 feet too high. Since the completion of this leveling a precise level line, by Mr. W. C. Hall, topographer of this Survey, from Morehead City via Greensboro and Salisbury, has fixed the elevation of this bench mark as 1,995.554 feet above mean sea level, and all of the elevations printed in the following list have been corrected in accordance with this new determination of the Biltmore central datum point.

The leveling listed below was done under the direction of Messrs. R. D. Cummin and J. H. Wheat, topographers, by Messrs. E. L. Faison and E. McLean Long, levelmen.

BILTMORE, VIA ASHEVILLE, AVERY, GYPSY, AND ANGELINE, TO MILLS RIVER.

	Feet.
Biltmore; bronze tablet in bottom stone of arch at rear (east side) of office of Biltmore Estate, marked "1996"	1,995.554
Asheville, Southern Railway depot; railroad track opposite ticket office window; top of nearest rail	1,985.683
Asheville, southeast corner of iron highway bridge over French Broad River; abutment pier, 15 feet from center of roadway, marked with chiseled cross in square, inside of circle	1,981.641
Asheville, 1½ miles west of; center one of five nails in root of large white-oak tree 8 feet south of center of road, 50 feet from corner of Mrs. Reywold's brick house	2,165.76
Asheville, 2 miles west of; nail in root of small oak tree 20 feet south of center of road, 200 yards west of store	2,160.53
West Asheville, 90 feet east of post-office; nail in root of black oak, 70 feet east of fork of Mills River and Brevard road, on south side of Sulphur Springs road, 40 feet northwest of corner of small white house	2,180.722
Carriers Springs, 42 feet from post-office; cross mark on bottom of south rail west side of road at crossing of Southern Railway (Murphy Branch)	2,139.28
Asheville, 3½ miles west of; nail in root of large white-oak tree at north end of bridge over electric road to power-house about halfway down long hill	2,094.11
Asheville, 3 miles southwest of; copper bolt in southeast corner of abutment pier of highway bridge over Hominy Creek, marked "U.S.G.S. 2002 Ft. B.M."	1,993.255
Asheville, 5½ miles southwest of; mark in large rock 5 feet west of center of road at top of long hill 150 feet north of small house on east side of road at bend; rock is marked with chiseled cross and circle	2,064.61
Bolling Mill Creek, ½ mile south of; nail in root of large Spanish oak tree 100 feet south of fork to southwest of Bent Creek road, on west side of road opposite small log house	2,104.67
Sandy Bottoms, just north of; copper bolt in large rock 150 feet beyond bridge over Bent Creek on west side of road, marked "U.S.G.S. 2022 Ft. B.M."	2,012.687
Avery, ¾ mile north of; copper bolt in large rock, east side of hollow, about 40 feet north of spring, 45 feet east of blacksmith shop at foot of Bald Mountain, marked "U.S.G.S. 2184 Ft. B.M."	2,175.222
Avery, crossroads south of; chiseled circle and point on rock 2 feet from southwest corner of store (road east crosses French Broad River 1½ miles from store over an iron bridge; road west is the Pink Beds road)	2,197.07
Old Gypsy post-office, 100 yards south of; nail in root of oak tree in edge of field west side of road	2,173.78
Old Gypsy post-office, 100 feet northeast of; copper bolt in rock on west side of road, marked "U.S.G.S. 2182 Ft. B.M."	2,173.132
Angeline, 150 yards west of post-office at fork of road west to Pink Beds; nail in root of large oak tree	2,104.01
Mills River; nail in north end of east sill of bridge over Mills River	2,079.55
Mills River, 20 feet east of post-office; copper bolt in rock, marked "U.S.G.S. 2086 Ft. B.M."	2,076.663

MILLS RIVER VIA KINGS BRIDGE TO FLETCHERS.

Mills River, 1½ miles south of, and ¾ mile north of Kings Bridge over French Broad River; nail in root of small oak tree on east side of road, 75 feet south of Hollingsworth's house	2,082.65

	Feet.
French Broad River, east bank of, near southwest corner of Kings Bridge; nail in root of large maple tree 400 yards south of Mr. Du Four's house	2,058.68
Kings Bridge, 1 mile east of, in front of Mr. Summey's house at top of hill 2 miles west of Mud Creek; nail in root of large oak tree	2,169.44
Mud Creek, 1¼ miles west of; nail in root of white oak tree on east side of road, 75 feet southwest of negro schoolhouse, 10 feet from center of road	2,153.28
Mud Creek, 400 yards west of; nail in root of large oak tree on east side of road, 75 yards north of house on top of hill	2,076.23
Mud Creek bridge, 150 yards east of; stone at top of hill, south side of road, marked with chiseled X in circle	2,076.04
Fletchers, 1½ miles south of; nail in west end of mudsill on north side of first small wooden trestle north of Asheville and Spartanburg Railroad	2,085.58
Fletchers, east side of stone curb of well at southeast corner of post-office; bronze tablet, marked "2123"	2,113.50
Fletchers, Asheville and Spartanburg Railroad station; top of rail	2,092.2

FLETCHERS, ALONG ASHEVILLE AND SPARTANBURG RAILROAD VIA ARDEN AND BUENA VISTA TO BILTMORE.

Fletchers, 1½ miles north of; nail in root of small white oak tree, 25 feet southwest of 13-mile post and 20 feet west of railroad track	2,112.20
Ten-mile post, first wooden trestle north of; nail in south end of west top sill	2,223.91
Skyland, top of rail opposite station	2,254.9
Buena Vista; mark on inside of east rail opposite mail-bag holder	2,233.59
Four-mile post, 150 yards north of; X mark in chiseled circle on rock, east side of road at north end of cut	2,103.66
Biltmore, northeast corner of brick platform at railroad station; X mark in chiseled circle on top of square stone	1,994.07

AVERY TO LANCES.

Mills River, Pink Beds road, and Avery Creek road, 20 feet east of forks of; nail in root of red-oak tree	2,215.51
Avery Creek, 100 yards south of; 350 yards south of road, on Mrs. S. R. Lance's property; copper bolt, 30 feet east of spring and near south end, on east side of lane between house and stable, marked "U.S.G.S. 2263 Ft. B.M."	2,256.312

MILLS RIVER TO SITTON.

Mills River, 1 mile west of; mark on small oak in forks of road forming acute angle westward, one road going to Sitton and Pink Beds, the other down toward river	2,178.21
Mills River, 2 miles west of, on Sitton road; nail in root of small walnut tree north side of road, 30 feet east of gate across road	2,228.52
Mills River, south fork, 50 feet east of ford of; mark in rock south side of road	2,126.88
Sitton, ½ mile northeast of; copper bolt in rock on east side of road next to river, 200 yards south of Mills River Baptist Church and ¼ mile north of Philip Allen's house; marked "U.S.G.S. 2166 Ft. B.M."	2,157.298

MILLS RIVER TO BREVARD OVER BOYLSTON CREEK ROAD VIA DAVIDSON RIVER.

Boylston Creek road, crossing of; mark in root on north side of large oak stump, 10 feet south of center of road	2,175.01
Turkey Creek, 1 mile north of; nail in root of large oak tree in front of S. R. Murray's house	2,151.65
Turkey Creek bridge, 50 yards north of; X mark in chiseled circle on stone 10 feet west of road and 20 feet north of Dr. Young's porch	2,171.68

	Feet.
Mills River, 6 miles south of; nail in root of walnut tree 10 feet east of road opposite old deserted log cabin on west side of road	2,157.87
Nine-and-one-half-mile post, first hill south of; nail in root of small blazed oak tree 6½ feet above road on east bank, halfway up hill	2,190.19
Henderson-Transylvania county boundary stone; X mark in chiseled circle. (This stone is 50 yards beyond branch which runs Mr. Reese's "Old Mill" on west bank of Boylston Creek; stone is on west side of road)	2,200.31
Henderson-Transylvania county boundary line, 300 feet north of; copper bolt in rock north side of road, 300 yards from the old Reese mill, 75 yards from point where road bends south, 100 yards from house on east side of road, 16 feet from center of road; bolt marked "2208"	2,199.+
Brevard, 7 miles north of; nail in root of large oak tree 12 feet west of road, 50 yards south of Miller's house, and 40 yards north of his barn	2,214.79
Brevard, 7 miles north of; mark on stone 10 feet west of center of road, halfway up small hill, and 75 feet north of small house on hilltop	2,243.09
Brevard, 6 miles north of; X mark in chiseled square on large rock in bank west side of road at top of hill, 150 yards south of spring at foot of large white-oak tree east side of road	2,332.45
Orr's house, ½ mile northeast of; nail in root of small oak tree on east side of road about 200 yards from foot of west side of "Little Mountain"	2,299.20
Davidson River, ¼ mile north of; mark on root of small oak tree west of road and 200 yards south of Dr. England's house	2,172.46
Davidson River, first hill south of; mark on small stone 10 feet west of center of road, 40 feet from top and on south side of hill	2,180.21
Brevard, 2 miles north of; at fork of Asheville, Henderson, and Wilson bridge roads; nail in root of small, double, white-oak tree east side of Asheville road and north side of Henderson road, 75 feet east of L. E. Rackley's house and 75 feet north of M. Gallimore's house	2,170.44
Brevard, chiseled cross on west end of bottom step, entrance to court-house	2,228.21

BREVARD, VIA WILSON BRIDGE, CARSON CREEK, COX'S STORE, BUCK FOREST, AND GRANGE, TO CALHOUN.

Brevard; bronze tablet, in corner stone of court-house, southeast corner of building, marked "2239"	2,230.005
Brevard, 1½ miles south of; chiseled circle and mark on rock 6 feet east of and 4 feet above center of road, 50 yards south of point where river and road begin to run parallel	2,113.31
Brevard, 2 miles south of; nail in root of small tree at south end and east side of Wilsons Bridge over French Broad River	2,109.45
Wilsons Bridge, ¾ mile south of; mark on root of small apple tree east side of road, 200 yards north of small white house on east side of road	2,128.34
Brevard, 3½ miles south of, at fork of road to Gowers; nail in root of small oak tree east of road	2,149.84
Dunns Rock, 200 yards north of Mr. Hallyburton's house, on hill by; mark on large rock, west side of road	2,134.60
Cæsars Head and Sassafras Gap roads, fork of; mark on stone step of old storehouse, east side of road	2,148.41
Carson Mountain, 700 feet from foot of; mark on rock west side of road leading over, 40 feet from a very large chestnut tree	2,239.31
Connestee Falls, ¼ mile north of; mark on rock, south side of road opposite "Big Rock" and 10 feet from it, at sharp curve in road	2,492.80
Connestee Falls, 100 yards east of last-described temporary bench mark; copper bolt in large rock, marked "2505"	2,495.925

	Feet.
Connestee Falls, 500 yards east of; mark on large rock north side of road and about 50 yards west of a small creek flowing into Carson Creek; rock is at sharp bend in road	2, 589. 17
Long Branch, 10 feet west of; mark on rock north side of road 8 feet from center of road, 40 feet east of fork of road over mountain to Dunns Creek.	2, 738. 63
Ten-mile post, ½ mile east of; mark 3 feet above ground and midway between ends of large granite rock 6 feet north of center of road	2, 706. 15
Little River, ¾ mile west of crossing of; mark (chiseled cross and circle) on large round rock 40 yards west of new log house, 10 feet from center of road, near fence corner	2, 699. 15
Cedar Mountain post-office, ½ mile south of; Cæsars Head and Buck Forest roads, forks of; also 5 miles north of Cæsars Head, 3 miles south of Buck Forest; copper bolt in large rock 30 feet east of Cox's store, 50 feet north of bridge over Little River, 10 feet from Toll Gate; copper bolt, marked "U.S.G.S. 2695 Ft. B.M."	2, 685. 819
Cox's store, 50 feet east of, at crossing of Hendersonville and Cæsars Head roads; chiseled cross in circle on large stone 60 feet north of bridge over Little River	2, 685. 38
Cox's store, 500 yards from crossing of Hendersonville and Cæsars Head roads; mark on large stone 10 feet north of center of road	2, 693. 40
Buck Forest Hotel, 2 miles south of; mark on large sandstone rock 6 feet west of center of road, 1 mile north of Cox's store, at crossing of Hendersonville and Cæsars Head roads	2, 721. 58
Buck Forest Hotel; nail in root of large oak tree 30 feet in front of	2, 787. 88
Buck Forest Hotel, 1 mile north of; chiseled cross in circle on large flat rock 6 feet east of center of road, 100 yards south of cottage on east side of road	2, 605. 19
Buck Forest Hotel, first house north of, on east side of road; nail in root of small oak tree 100 feet north of	2, 577. 90
Buck Forest Hotel, 2½ miles north of, and 150 feet north of Daisy Falls; chiseled cross and circle, north end of large granite rock 6 feet west of center of road, 75 feet south of bridge over stream crossing road and flowing west	2, 404. 18
Calhoun, 3½ miles south of; chiseled cross in circle on rock 40 feet in front of schoolhouse on small bank west side of road, 75 yards west of Old Mill bridge across Little River where latter starts to parallel road	2, 217. 84
Grange, ¾ mile south of; mark on rock west side of road, 20 feet north of old deserted stone house, 300 yards south of bridge across Little River	2, 110. 179
Calhoun; mark on east end bottom stone step of Wilson's store	2, 144. 23

CALHOUN, VIA BOWMANS BLUFF AND HORSESHOE. TO KINGS BRIDGE.

Calhoun; bronze tablet in southwest corner of foundation of Wilson's store, marked "2154"	2, 144. 477
Calhoun, 2 miles north of; chiseled cross and circle on large rock 10 feet south of and 4 feet above road, 40 feet from south bank of river where road curves slightly away from river	2, 090. 29
Calhoun, 3 miles northeast of; mark on large rock 6 feet south of and 4 feet above center of road, 200 yards east of county line on river bank at point where road makes sharp bend	2, 090. 59
Bowmans Bluff, 3 miles southwest of; nail in root of elder tree 15 feet south of center of road on bank, 75 feet east of Lawrence's house	2, 095. 23
Bowmans Bluff, 1½ miles west of; nail in root of oak tree 10 feet from center of and 4 feet above road, in fork of main road and road turning south; nail is 4 feet from the oak and tree, is on west side of road, which at this point bends east	2, 119. 61

	Feet.
Bowmans Bluff, 1½ miles west of; chiseled circle and cross on rock 8 feet south of and 5 feet above center of road, 75 yards east of small stream crossing road in front of Crown cottage, which is situated on hill 100 yards west of sharp bend in road	2, 083. 19
Bowmans Bluff, 1 mile west of; chiseled cross and circle on large rock 10 feet north of center of road, on bank of river at sharp bend in road where it joins river	2, 075. 49
Bowmans Bluff, 1 mile west of; copper bolt in large rock west side of road on river bank, at sharp bend in road where it parallels river, 10 feet from center of road; bolt is marked "U.S.G.S. 2083 Ft. B.M."	2,074. 254
Horseshoe and Henderson roads, 250 yards south of fork of; nail in root of small oak tree south side of road, at top of hill, northeast of Bowmans Bluff, 100 yards south of old storehouse on east side of road	2, 147. 58
McLeans Bridge road, ½ mile south of point where it joins this road; nail in west root of oak tree west side of road, near top of long hill	2, 156. 55
Horse Shoe, 2 miles west of; chiseled circle and cross on top stone, south end of east pier Hendersonville and Brevard Railroad bridge over French Broad River	2, 070. 67
Horse Shoe, 600 yards east of Davenport's store; nail driven in notch cut in large birch stump 20 feet high, south side of Hendersonville road at point where Kings Bridge road turns north; it is 300 yards east of Hendersonville and Brevard Railroad, 20 yards east of bridge over small stream	2, 063. 09
Hendersonville, Mills River, and Horseshoe roads, crossing of; nail in root of large oak tree 10 feet east of center of road, at top of hill, 60 feet from Cap. Miller's house	2, 132. 10

FROM ASHEVILLE AND BREVARD ROAD UP DAVIDSONS RIVER.

Davidsons River, 1½ miles from Brevard road; mark on rock left side of road, opposite blazed and marked poplar tree left side of road, ½ mile above where road turns to right across river	2, 151. 38
Avery Creek, 200 yards west of mouth of; copper bolt in rock in bed of rocks on right side of road toward river, 40 feet east of ford; the road forks 50 yards beyond ford, the right-hand road going up Avery Creek and the left-hand or straightforward road going up Davidsons River; bolt is marked "U.S.G.S. 2180 Ft. B.M."	2, 170. 439

CALHOUN TO WILSONS BRIDGE, VIA DAVIDSONS RIVER.

Calhoun, 3 miles west of and 1½ miles east of Davidsons River post-office; nail in root of pine tree 20 feet from spring south side of road, 100 yards west of Allison's house	2, 096. 12
Davidson River; cross mark on bottom stone step of post-office (west side).	2, 101. 67
Wilsons Bridge, 1½ miles east of; mark on large rock east side of road at point where road bends parallel with river; rock is 4 feet above road..	2, 105. 04
French Broad River, ½ mile east of Wilsons Bridge; mark on stone (east side of road) held in roots of oak tree, 75 feet east of small house on west side of road	2, 114. 15

GRANGE UP COAL CREEK.

Grange, Zackey & Rogers's store; mark on west end of upper stone step of store	2, 099. 11
Grange, 1½ miles east of; nail in second log from bottom in northwest corner of small stable abutting larger one on west side; stables on south side of road	2, 136. 78

	Feet.
Holly Springs church, 50 feet northeast of, on south side of road in fence corner; nail in root of oak tree 4 feet north of tree in corner	2, 219. 37
Osteen, 100 yards southeast of; copper bolt in rock on north side of road where road makes a bend; bolt is stamped "U.S.G.S. 2201 Ft. B.M."	2, 191. 450

COX'S STORE, VIA CÆSARS HEAD, VENUS, RIVER VIEW, TO MIDDLE SALUDA.

Cox's store, 1 mile south of; mark on rock east side of road, 10 feet from and 4 feet above center of road	2, 848. 61
Cæsars Head, 3 miles north of; chiseled circle and cross on top of State line boundary stone east side of road at fork of Jones Gap road	2, 924. 66
Cæsars Head, 2 miles north of and about ½ mile south of State Line; chiseled cross and circle on rock west side of road 50 yards north of stream that crosses road at foot of long hill north of tollgate; mark is 6 feet from and 4 feet above center of road	2, 835. 66
Cæsars Head, 1½ miles north of; chiseled cross and circle on large stone 10 feet east of center of road, 40 feet north of tollgate	2, 996. 16
Cæsars Head, 1¼ miles north of; chiseled circle and cross on small rock south side of road near sharp bend that curves around small hollow	3, 022. 25
Cæsars Head, 1 mile north of; mark on projecting rock east side of road halfway up small hill; 100 yards south of an old log cabin on east side of road; cabin is first house south of tollgate, inside of field, and is deserted; opposite the rock stand two dead chestnut trees	3, 067. 323
Cæsars Head Mountain, mark on one of the highest rock points on summit of; 40 feet south of the rock known as Cæsars Head	3, 217. 982
Cæsars Head Hotel; nail in top of fourth fence post from front porch in east fence	3, 074. 06
Green Mountain Gap, summit of road through; nail in root of large chestnut tree, 40 feet east of road	2, 347. 41
Dogwood Springs, ¼ mile south of; mark on rock west side of road 5 feet north of blazed pine tree, 300 yards north of forks of roads to Slicker Falls and Venus	2, 081. 35
Little Bald Rock, east side of where road first touches the rock going down hill; mark north side of road about 5 feet from center	1, 631. 41
Venus, 1 mile northwest of; nail in root of pine tree in forks of new Cæsars Head and Greenville road and the old direct Pumpkintown road.	1, 398. 74
South Saluda River and Matthews Creek, 300 yards north of confluence of; copper bolt, marked "U.S.G.S. 1115 Ft. B.M." in rock on west side of road between same and Matthews Creek, 20 feet west of center of road; 50 feet north of a gate to Mr. Ferguson's house	1, 105. 848
Venus, ½ mile west of; mark on large rock 5 feet north of and 3 feet above center of road on side opposite river	1, 082. 20
Hagood's (Capt. John) house, iron post at top of hill near, on north side of main Cæsars Head and Greenville road, 10 feet from center of road; about 200 yards east of forks of roads to Wattacoo and Pumpkintown via southern fork and to Cæsars Head via northern fork; post marked "1066"	1, 057. 179
Middle Saluda River, bridge over; head of bolt west end of north railing and ½ mile west of Mr. Jesse Cleveland's house and mill and 100 yards east of junction of Cæsars Head and Jones Gap roads	1, 052. 04
Cleveland's (Jesse) house, 1 mile north of; nail in root of large oak tree, 6 feet west of center of road, 30 feet north of gap, and ¾ mile south of River View (Jenning's store)	1, 047. 43
River View (Jenning's store); mark on "stile rock" 30 feet south of front door of Jenning's store, on west side of road	1, 051. 09

	Feet.
River View (Jenning's store), ¾ mile above; top of kingbolt, first bent south and east side of bridge over Middle Saluda River, on road that turns off from Jones Gap road, and is known as Gap Creek road	1, 054. 43
Middle Saluda, ¼ mile southeast of; iron post, marked "1115," in forks of Jones Gap and Gap Creek roads, 200 yards north of Mr. Cantrell's house and 200 yards west of where Gap Creek road crosses Middle Saluda River.	1, 105. 998

CARSON CREEK, VIA JEPTHA, TO EASTATOE FORD.

Carson Creek, 1 mile east of; chiseled cross and circle on large rock 6 feet west of and 3 feet above center of road, in bank, 50 yards west of small stream running north, 100 yards southwest of small cottage on north side of road	2, 164. 78
Brevard, 5¾ miles from, at fork of road, 9 miles to Jones Gap; chiseled cross and circle on rock in angle of road forks	2, 182. 47
Carson Creek; nail in root of large maple tree, 60 feet north of road to Eastatoe, 30 feet west of road leading across French Broad River, 75 feet east of schoolhouse, 40 feet north of spring	2, 147. 04
Bridge, 200 yards northeast of; nail in root of large tree east side of road, 20 feet inside of fence and on edge of small stream 200 yards north of river.	2, 134. 17
Brevard road, 20 feet south of, at point where it turns off east; marked rock in bank east side of road, 20 feet east of Eastatoe road	2, 142. 25
Eastatoe ford, 6 miles east of, at fork of Jones Gap and Brevard roads; nail in east side of root of small tree in bank north side of Brevard road	2, 229. 77
Brevard, 4-mile post, 50 feet east of; bench cut in large stone south side of road, 100 feet west of old house, 50 feet west of small stream crossing	2, 177. 05
Brevard, 6 miles from; bench made on rock 5 feet north of center of road, opposite house, and 100 yards east of 2-story frame house north side of road	2, 206. 70
Webster road, fork of, to north; nail in root of maple tree, north side of road	2, 184. 76
Brevard 8-mile post, ¼ mile east of; chiseled cross and circle on northwest corner of bottom stone step of O. N. Irwin's store, opposite large schoolhouse north side of road	2, 238. 44
Brevard, 8 miles southeast of; mark on southeast corner of stone wall 20 feet west of and 4 feet above center of road, in front of Sam Galloway's.	2, 208. 85
Jeptha, ½ mile north of, and 1½ miles north of Eastatoe Ford; nail in root of red-oak tree 12 feet west of and 4 feet above center of road, 200 yards north of Widow Aikens's house	2, 178. 65
Jeptha, ½ mile south of, and ½ mile north of Eastatoe Ford; chiseled cross and circle on large rock in west road bank, 40 feet south of 9-mile post from Brevard, 5 feet from center of road	2, 179. 79
Jeptha, ½ mile south of, and ½ mile north of Eastatoe Ford; copper bolt in large rock 5 feet west of center of road in bank, 40 feet south of 9-mile post from Brevard; marked "U.S.G.S. 2189 Ft. B.M."	2, 180. 025

CHERRYFIELD, ALONG WEBSTER ROAD, VIA GLOUCESTER GAP, TO FRENCH BROAD RIVER.

Allens Hill, 50 feet east of summit; mark on flint rock 6 feet north of center of road in dirt bank	2, 691. 26
Webster road, south side of, 50 feet east of where road crosses small draw; nail in knot on east side of large chestnut tree, blazed and marked "U.S.G.S. 2793"	2, 784. 27
Gloucester Gap, 50 feet east of summit of road through; nail in blaze on root of hickory tree, 5 feet west of center of road; tree is marked in blaze "U.S.G.S. 3026"	3, 017. 14
Webster road; stone south of, opposite guidepost, road to right "Shoal Creek Church 4 miles;" road to left Webster road	2, 723. 08

	Feet.
Gloucester Gap, 300 yards west of first hill west of; mark on rock south side of road 70 yards east of where road goes into small hollow, making a sharp bend crossing ravine	2,803.94
Brevard 10-mile post, 50 feet west of; mark on rock north side of road	2,686.33
Balsam Grove, 3 miles southeast of; copper bolt in large rock on west side of road, 100 yards north of bridge over north fork of French Broad River, which at bench mark parallels road on east. Bench mark is first large stone west of river and is 10 feet from center of road; center of rock is 6 feet in height, marked "2625"	2,616.018

EASTATOE FORD, VIA TIP TOP, ALONG SAPPHIRE ROAD, TO INDIAN CREEK.

Eastatoe Ford; nail in root of sycamore tree west side of road, north bank of river, near fork of Cashes Valley road	2,167.79
Eastatoe Ford, 1 mile southwest of, and 10½ miles southwest of Brevard; mark on rock north side of road at point where road bends abruptly to the west	2,190.50
West Fork, 50 feet south of bridge over; 300 yards north of confluence of West and South forks, 50 feet from river; mark on small stone, 5 feet west of center of road	2,197.06
Chase's house, trail past; nail in root of large chestnut tree 75 feet up on trail from main road and in plain sight from main road; trail leaves road opposite old log cabin	2,300.30
Eastatoe Ford, 4 miles from; nail in notch on bend of hickory tree north side of trail where it runs near top of hill	2,500.26
Eastatoe Ford, 4½ miles west of, and 14½ miles southwest of Brevard; chiseled cross and circle on large rock 5 feet south of and 2 feet above middle of road, 100 yards east of small house on hillside north of road	2,534.42
Eastatoe Ford, 5½ miles west of; chiseled circle and cross on large rock south side of road 4 feet above and from center of road, 300 yards west from old house on hillside north of road, and 200 feet from footbridge across creek	2,511.31
Tip Top; nail in root of small oak tree 20 feet north of road, 75 feet south of schoolhouse (larger of two small oaks standing together)	2,772.95
Tip Top, 2 miles west of, on Sapphire road; copper bolt in large rock 15 feet from west end of bridge over Indian Creek, 6 feet from and 2 feet above center of road, marked "U.S.G.S. 2743 Ft. B.M"	2,733.37

EASTATOE FORD ALONG PICKENS ROAD, VIA GALLOWAY AND STATE LINE TO CANE BRAKE ON TOXAWAY RIVER.

Eastatoe Ford, ½ mile south of, at fork of roads; nail in root of small double white-oak tree on east bank of small stream running south across road at point where East Fork road turns off east; tree is 40 feet southeast of road forks, 20 feet south of main road, and root is 1 foot down bank	2,189.21
Eastatoe Ford, 2½ miles south of; mark on stone south side of road at top of hill	2,500.91
Eastatoe Ford, 2¾ miles south of; nail in root of large maple tree on east side of road in ravine, ¼ mile north of top of Blue Ridge and 12 miles south of Brevard, between two large streams	2,551.63
Eastatoe Ford, 3 miles south of, on Pickens road; nail in root of black gum tree west side of road, 200 yards north of top of Blue Ridge	2,696.51
Eastatoe, 5 miles south of, and ½ mile north of Galloway; nail in root of large oak tree west side of road in bank, 4 feet above road center, about 100 yards south of small cemetery top of hill west side of road	2,280.84
Galloway, ½ mile south of; nail in root of small oak tree on west side of Cane Brake road at fork of Pickens road; point is 10 feet from and 2 feet above center of road	2,069.99

	Feet.
Galloway, 1½ miles south of; nail in root of large white-oak tree 20 feet west of center of road, 300 yards south of point where trail from Galloway enters main road, and 2 miles north of State Line	2, 201. 41
State Line, ½ mile north of, on Pickens road; chiseled cross and circle on rock east side of road, 300 yards south of small log hut	1, 920. 84
State Line, 200 yards north of; chiseled circle and cross on large stone 10 feet west of and 4 feet above center of road, 50 yards north of small stream running west, 100 yards north of small log cabin on east side of road, and 150 yards north of Rocky Creek	1, 675. 88
State Line, 100 yards north of, 50 feet north of small stream running west; copper bolt 15 feet above and 10 feet from center of road, in large overhanging rock, marked "U.S.G.S. 1676 Ft. B.M."	1, 667. 028
State Line, ½ mile south of, at fork of Cane Brake and Pickens roads; nail in root of red-oak tree 20 feet west of and 5 feet above Pickens road, and 10 feet south and 5 feet below Cane Brake road	1, 981. 64
Cane Brake, 1 mile east of; mark (chiseled circle and cross) on large rock 5 feet west of and 3 feet above center of road, ½ mile from Pickens road, 40 feet north of large chestnut tree on west side of road, and 10 feet east of large rock	1, 876. 15
Cane Brake, ¼ mile east of foot of hill at, on level of road; chiseled cross and circle on rock 4 feet west of center of road on hillside, near bend in road.	1, 378. 55
Cane Brake, 250 yards from foot of hill at; copper bolt, marked "U.S.G.S. 1263 Ft. B.M.," in large rock on east side of road 200 yards from junction of Rocky Creek and Toxaway River at State Line; rock is 30 feet west from road, which road runs east and west from Pickens road to Toxaway River, and the fork is 400 yards south of Rice's store	1, 253. 75

EASTATOE FORD, VIA EAST FORK, TO SASSAFRAS GAP.

Eastatoe Ford, 2 miles east of, on East Fork road; nail in root of large maple tree north side of road near bottom of long hill, 5 feet from and 4 feet above center of road	2, 240. 90
East Fork, 1 mile west of; chiseled cross and circle in rock 5 feet north of and 2 feet above center of road, on north bank of East Fork River, ½ mile east of bridge, 200 yards east of stream running south into East Fork, and is halfway up hill	2, 247. 21
Gillespie's house, 100 yards south of; on large rock east side of road; ½ mile south of large white church which stands close to where the road forks east to go to East Fork; rock is about 30 feet east of east bank of East Fork of French Broad River, 1 mile north of where road forks and signboard reads "5½ miles to Sassafras Gap;" copper bolt, marked "U.S.G.S. 2285 Ft. B.M."	2, 275. 768
Sassafras Gap road, 200 feet south of fork of Pickens Gap road; mark on rock 3 feet east of center of road, 250 yards north of a blacksmith shop which stands on west side of road, and 50 feet from east bank of East Fork	2, 287. 42
Gladys Fork crossing, ½ mile south of Pickens Gap and Sassafras Gap road forks; mark on large rock 5 feet west of center of road	2, 300. 19
Sassafras Gap, 2½ miles north of; nail in root of small chestnut tree west side of road 8 feet from center of road and 3 feet below it, down a small bank toward a small stream below in ravine; tree is 300 yards south of small house at foot of hill, 40 feet south of large chestnut tree, and 45 feet north of large hemlock tree	2, 664. 47
Sassafras Gap, 290 yards north of State Line; copper bolt, marked "U.S.G.S. 2785 Ft. B.M.," set in very large rock east side of road ½ mile south of frame house on same side of road, 200 yards north of log cabin on same side of road, and 100 yards south of stream crossing road to west	2, 775. 48

GEORGIA.

FANNIN, UNION, AND LUMPKIN COUNTIES.

ELLIJAY QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the masonry water-table of the front wall of Boling & Crawford's store at Blue Ridge, and marked "U. S. Geological Survey. 1,751 Feet. B. M." The elevation of this bench mark was accepted as 1,750.968 feet above mean sea level, as based on the best adjustment of railroad levels which it was practicable to make from Brunswick via Atlanta and Marietta. The leveling was done under the direction of Mr. A. E. Murlin, topographer, by Mr. Thomas S. Mauldin, jr.. levelman.

BLUE RIDGE TO MINERAL BLUFF ALONG RAILROAD.

	Feet.
Blue Ridge, Boling & Crawford's store; bronze tablet set in front of, marked "1751"	1,750.968
Blue Ridge, 2 miles north of; nail in root of small oak tree about 40 feet east of railroad track on side of Ducktown road at crossing	1,659.43
Toccoa River railroad bridge, top of pier at south end; marked point on marble block	1,580.77
Mineral Bluff, railroad station; marked point on water-table 3 feet from northwest corner	1,585.27

MINERAL BLUFF TO MORGANTON.

	Feet.
Mineral Bluff, Burrell's blacksmith shop; nail in root of small maple tree 55 feet west of shop	1,622.80
Mineral Bluff, ½ mile east of; copper bolt in ledge of slate on left of road, 225 feet east of Burrell's blacksmith shop, marked "U.S.G.S. 1644 Ft. B.M."	1,644.281
Mineral Bluff, 1⅜ miles east of; rail in root of large oak tree 25 feet to left of road	1,740.17
Mineral Bluff, 1¾ miles east of; nail in root of large oak tree 150 feet beyond forks of road to Cut Cane Creek	1,826.16
Mineral Bluff, 2½ miles east of; nail in root of large oak tree 15 feet to right of road	1,900.80
Mineral Bluff, 3 miles east of; nail in root of large oak tree on left of road.	1,864.00
Morganton, grove opposite Baptist church; copper bolt, marked "U.S.G.S. 1839 Ft. B.M."	1,838.972

MORGANTON TO BLUE RIDGE.

	Feet.
Morganton, ¼ mile west of; nail in top of small stump, across road from gate just beyond negro cabin	1,727.86
Morganton, ¾ mile west of; nail in root of small oak tree on left of road on bank, about 90 feet beyond fork of road to Van Zant's	1,707.83
Morganton, 1 mile west of; 200 feet from milepost; nail in root of large oak tree left of road	1,674.84
Morganton, 1½ miles west of; 100 yards beyond Cochran's dwelling; nail in root of small oak tree at fence corner on right of road	1,614.70
Toccoa River, 110 yards beyond bridge across; nail in trunk of white-oak tree on right edge of road	1,595.29
Morganton, 2⅜ miles west of; nail in root of large white-oak tree on left of road	1,759.68

	Feet.
Ducktown road, fork of; nail in root of small oak on right of road, about 125 feet beyond signpost	1,804.51
Weavers Creek, crossing of; nail in root of sycamore tree on right of road.	1,605.91
Blue Ridge, ⅜ mile northeast of railway station; nail in root of small oak tree on right of road, about 200 feet from forks of road to Ellijay	1,794.83
MORGANTON TO BUTTS'S STORE.	
Morganton, 1 mile east of; nail in root of small oak tree at crossroads to Dora post-office	1,786.23
Morganton, 1¼ miles east of; nail in root of oak tree on right of road at spring in hollow	1,750.38
Morganton, 2 miles east of, near Ratio Allen's; nail in root of large oak tree on right of road	1,785.54
Morganton, 3⅜ miles east of; nail in top of small stump on bank right of road, 325 feet from house	1,747.99
Hemp, ¼ mile west of; nail in root of small oak tree in fence corner across road from small house	1,762.15
Hemp, just east of post-office; point marked on large rock at fence corner, right of road	1,777.93
Brackett's store, road forks opposite church near; copper bolt southwest of and 110 feet from intersection of roads, marked "U.S.G.S. 1906 Ft. B.M."	1,905.958
Morganton, 6 miles east of; nail in root of small white oak tree at fence corner on left of road in front of school house	1,835.12
Morganton, 7¼ miles east of, 100 yards west of crossing of Hemptown Creek; nail in root of oak tree on left of road to Camp Creek	1,928.94
Hemptown Gap, summit of; nail in root of oak tree on right of road	2,209.00
Hemptown Gap, summit of; copper bolt 65 feet southwest of nail in root of white oak tree on right of road; marked "U.S.G.S. 2211 Ft. B.M."	2,210.871
Morganton, 9½ miles east of; nail in root of large oak tree, west side of road beyond schoolhouse	2,093.75
Morganton, 10 miles east of; nail in top of small persimmon stump on left of road about 375 feet beyond creek crossing	1,922.18
Butts's store, ¾ mile northwest of; nail in root of large oak tree on bank, right of road at top of hill 200 feet beyond creek	1,941.52
Butts's store, ⅛ mile northwest of; nail in root of oak tree on right of road near schoolhouse on top of hill	2,001.03
BUTTS'S STORE TO DIAL.	
Butts's store, ⅞ mile south of; nail in root of large oak tree about 30 feet from fork of road to left	2,057.87
Butts's store, 1½ miles south of; nail in root of oak tree at fork of Murphy road	2,158.84
Butts's store, 2¼ miles southwest of; nail in root of white-oak tree 30 feet to left of road, about 80 feet beyond forks of road near church	2,167.07
Butts's store, 2⅞ miles southwest of; nail in top of small stump between two maple trees on right of road about 200 feet beyond branch at foot of big hill near Coochey's dwelling	2,062.47
Young Cane Creek, 800 feet beyond last crossing of; nail in root of oak tree on right of road	2,175.41
Skienah Gap, summit of; copper bolt in large rock in lane to left at dwelling, marked "U.S.G.S. 2388 Ft. B.M."	2,388.326
Friendship Church; nail in root of oak tree at fork of road leading to Morganton	2,297.78
Craytonia; nail in top of stump on right of road in lane	2,186.16

	Feet.
Craytonia, ¾ mile southwest of; nail in root of middle of three oak trees on right of road	2,117.89
Craytonia, 1¼ miles southwest of; nail in root of oak tree on right of road on hillside near branch	2,076.78
Sugar Hill Church; nail in root of white oak tree on right of road at bend in hollow	2,011.28
Skienah, fork of trail to right just beyond road to; nail in root of white-oak tree	1,986.03
Morganton, fork of road, near William Woody's house; copper bolt in large rock, marked "U.S.G.S. 1981 Ft. B.M."	1,980.57
Toccoa River and Skienah Creek; nail in root of oak tree on right of road in bend just above confluence of streams	1,938.42
Dial, ¼ mile east of; nail in root of red-oak tree in hollow on right of road at sharp bend	1,959.13
Dial; nail in root of large oak tree on right of road in bend in front of Chastain's dwelling	1,942.68

DIAL TO MORGANTON.

Dial, 1¼ miles west of; nail in root of oak tree on bank to right of road about 100 yards from barn at Van Zant's (Cochran) near fork of Morganton and Ellijay roads	1,887.24
Cochran's, ¼ mile west of; copper bolt in rock at north edge of road, marked "U.S.G.S. 1887 Ft. B.M."	1,886.636
Cochran's, ¾ mile west of; nail in root of post-oak tree on right of road	1,904.80
Dial, 2¾ miles from; nail in root of middle of three oak trees, left of road, at top of big hill	2,073.55
Dial, 3¼ miles from; nail in top of small stump to right of road at foot of very steep slope	2,015.08
Wilscot, 100 yards beyond small store 1 mile south of; nail in root of large white-oak tree on bank on right of road	1,884.99
Wilscot, ¼ mile southeast of; rock on right of road near spring in rocky ledge above river; copper bolt, marked "U.S.G.S. 1859 Ft. B.M.'	1,859.188
Wilscot, across road from barn at; nail in root of large oak tree	1,921.02
Wilscot, ⅜ mile north of; nail in root of large oak tree west of road	1,843.68
Morganton, 5 miles south of, at church above Wilscots Mills; nail in root of oak tree on right of road on bank about 50 feet beyond fork of roads to Morganton and Blue Ridge	1,723.88
Morganton, 250 yards south of 4-mile post to; nail in root of large oak tree right side of road	1,846.15
Morganton, 3¼ miles south of; nail in root of oak tree left of road	1,959.53
Morganton, 150 feet from top of hill at 3 mile post from; nail in root of small oak tree on left of road	2,071.14
Morganton, 2¾ miles south of; nail in root of oak tree about 15 feet to right of road	2,023.97
Morganton, 100 yards south of 2-mile post from; nail in small stump by blazed oak tree	1,875.04
Morganton, 2 miles south of; nail in root of large white-oak tree on right of road about 200 feet beyond fork of road to Dahlonega	1,797.70
Morganton, 1¼ miles south of; nail in root of white-oak tree on bank to right of road in bend	1,764.94
Morganton, 200 yards beyond 1-mile post from; nail in root of oak tree on left of road	1,793.61
Morganton, grove opposite Baptist Church; copper bolt, set in flint rock, marked "U.S.G.S. 1839 Ft. B.M."	1,838.972

BUTTS'S STORE, VIA MULKY GAP, TO DIAL.

	Feet.
Butts's store, iron post set in ground alongside of; marked "1966"	1,965.786
Rocky Schoolhouse, 375 feet west of; nail in root of oak tree on left of road	2,002.12
Gaddistown road, 350 yards east of fork of; nail in root of small white-oak tree about 15 feet to right of road	1,990.88
Blairsville, near 6-mile post from; nail in top of stump on right of road 200 feet beyond blacksmith shop	1,964.04
Bynum, ¾ mile west of; nail in root of large, double oak tree on right of road 200 feet beyond branch	1,913.62
Blairsville, 5-mile post, 400 feet beyond; nail in root of oak tree in grove on left of road	1,902.52
Bynum, ⅞ mile southeast of; nail in root of large oak tree on left of road about 75 feet beyond branch	1,973.31
Blairsville, 5 miles southwest of; at intersection of cross and main roads near Coosa Creek post-office; nail in root of oak tree on right of road	2,085.81
Blairsville, 6 miles southwest of, at signpost; nail in root of small oak tree 50 feet from fork of roads	2,004.19
Blairsville, 6½ miles southwest of; nail in root of maple tree at right of road at creek crossing	2,032.78
Blairsville, 7¾ miles southwest of; nail in root of large oak tree on hillside to right of road	2,268.08
Blairsville, 8 miles southwest of; 600 feet beyond milepost; nail in root of sapling on bank on right of road about 100 feet beyond branch	2,393.35
Mulky Gap, 200 yards north of summit; copper bolt in large rock on left of road; marked "U.S.G.S. 2760 Ft. B.M."	2,760.502
Mulky Gap, summit of; nail in root of oak tree on right of road	2,826.04
Mulky Gap, ¼ mile from top of; nail in small chestnut stump on left of road	2,728.17
Blairsville, 10-mile post from; nail in root of white-oak tree on right of road	2,483.44
Polk, ½ mile south of; nail in root of white-oak tree to right of road 20 feet.	2,272.94
Coopers Creek, 1,000 feet beyond bridge across; nail in root of large white-oak tree on bank at left of road at bend	2,264.11
Polk, 2½ miles south of; nail in trunk of small sapling 25 feet from blazed white-oak at edge of road	2,383.82
Polk, 2¾ miles south of; nail in root of large oak tree 16 feet to right of road	2,366.80
Ridge, top of; nail in root of blazed oak tree on right edge of road	2,456.50
Polk, 3 miles south of; nail in top of small stump 15 feet from large blazed oak tree 15 feet to right of road at top of zigzag	2,469.92
Polk, 3 miles south of; nail in root of oak tree, left edge of road just beyond first sharp turn above schoolhouse	2,304.83
Toccoa River, ¼ mile east of Cavender bridge; nail in root of white-oak tree on left edge of road	2,139.06
Toccoa River, large rock near north end of Cavender bridge; copper bolt, marked "U.S.G.S. 2095 Ft. B.M."	2,094.956
Cavender bridge, ½ mile west of; nail in root of large poplar tree left of road at branch in bend	2,095.09
Cavender bridge, 1¼ mile west of; nail in root of small sapling on right of road	2,139.22
Cavender bridge, 2 miles west of; nail in root of large oak tree on west of road	2,182.25
Cavender bridge, 2½ miles west of; nail in root of small white-oak tree on bank at right edge of road near branch beyond third house from bridge.	2,099.38

	Feet.
Coopers Creek bridge, just north of; nail in root of small hickory tree near bend in road	2,054.37
Church on left of road, 100 feet west of; nail in trunk of bent oak tree on bank to right of road	2,106.00
Cavender bridge, 4¼ miles east of; nail in root of oak tree on bank to right of road near top of hill	2,128.47
Toccoa River ford, east of; nail in root of oak tree on edge of bank on right of road	2,036.92
Toccoa River ford, first dwelling south of; nail in root of oak tree in fence corner	2,036.63
Rock Creek ford, at forks of road to Windingstair Gap, 100 feet west of; nail in root of white-oak tree on left of road	2,024.83
Rock Creek ford, ¼ mile west of; nail in root of poplar tree at third crossing of branch	2,057.54
Rock Creek ford, 1 mile northwest of; nail in root of blazed white-oak tree on left of road just beyond top of big hill	2,295.94
Rock Creek ford, 1⅝ miles northwest of; nail in root of oak tree on left of road	2,130.42
Rock Creek ford, 2 miles northwest of; nail in root of oak tree on right of road just beyond branch	1,963.88
Rock Creek ford, 2⅝ miles northwest of; nail in root of oak tree 10 feet to left of road	2,092.47
Toccoa bridge (near Dial), ⅝ mile south of; nail in root of oak tree on bank to right of road	1,977.56

DIAL-WINDINGSTAIR GAP ROAD; UP ROCK CREEK FROM.

Rock Creek, 100 feet from road fork at; and ¾ mile south of mouth of; nail in root of blazed white-oak tree on side of road	2,024.83
Schoolhouse, 1¾ miles south of mouth of Rock Creek; nail in root of blazed white-oak tree across road from	2,267.52
Rock Creek, second crossing of; copper bolt in rock on left edge of road, marked "U.S.G.S. 2199 Ft. B.M."	2,199.583

CAVENDER BRIDGE, VIA GADDISTOWN, TO JAY.

Cavender bridge, 1¼ miles south of; nail in root of large oak tree at corner of porch of store on right of road	2,170.96
Cavender bridge, 2 miles south of; nail in root of small beech tree at fence corner in front of small vacant dwelling on right of road	2,182.00
Cavender bridge, 2¾ miles south of; nail in root of large oak tree at end of blacksmith shop opposite John Cavender's dwelling	2,252.54
Blairsville 18-mile post, 110 feet north of; nail in root of small oak tree on bank to right of road	2,168.35
Gaddistown post-office; nail in root of center one of row of walnut trees opposite	2,147.13
Gaddistown, ½ mile south of; large rock across road from Anderson & Jones's store at forks of road, marked "U.S.G.S. 2152 Ft. B.M."	2,151.93
"Blairsville 21 miles" post, 375 yards north of; nail in root of small oak tree on right of road	2,242.30
Coopers Gap, 1,000 yards north of summit; nail in root of large oak tree at fence corner	2,512.06
Coopers Gap, summit of; copper bolt 175 feet to left of road in field, marked "U.S.G.S. 2861 Ft. B.M."	2,860.988
Dahlonega, 11⅛ miles northwest of; nail in stump on right of road just beyond dwelling	2,400.64

	Feet.
Dahlonega, 10½ miles northwest of; nail in root of small oak tree on bank on right of road about 100 yards from trail on left	2, 027. 80
"Dahlonega 10 miles" post, top of small hill near; nail in root of oak tree on bank at right of road	1, 757. 90
Dahlonega, 9½ miles northwest of; nail in root of oak tree at fork of roads.	1, 694. 74
Two Run, ½ mile north of; nail in root of walnut tree at fence corner of old dwelling	1, 637. 04
Two Run; nail in root of large oak tree across road from post-office	1, 675. 57
Two Run, 2 miles southeast of; copper bolt in large quartz rock on right of road about 700 feet beyond fork of Narrow Gauge and Dahlonega roads, marked "U.S.G.S. 1632 Ft. B.M."	1, 632. 057
Rider's store, 400 feet south of church near; nail in root of small oak tree 10 feet to right of road	1, 632. 51
Jay, 3½ miles northeast of; nail in root of maple tree on left of road about 200 feet beyond house at branch crossing	1, 498. 33
Jay, 2¼ miles northeast of; nail at foot of small oak tree 10 feet to right of road 150 feet beyond dwelling at foot of large hill	1, 541. 64
Jay, 1½ miles northeast of; nail in root of oak tree between oak and hickory trees across road from schoolhouse	1, 607. 29
Jay, 1⅛ miles northeast of; nail in root of oak tree 20 feet to left of road.	1, 526. 47
Jay, copper bolt in rock under west end of bridge across Etowah River, marked "U.S.G.S. 1360 Ft. B.M."	1, 360. 657

BYNUM, VIA BLAIRSVILLE, TO IVY LOG AND CULBERSON.

Bynum, ½ mile east of; nail in small stump in fence corner on left of road near house	1, 909. 66
Bynum, 2 miles east of; nail in root of oak tree on bank right of road on side of hill	1, 878. 25
Nottely River, fork of trail near top of hill above; nail in root of large oak tree	1, 967. 18
Nottely River bridge, 600 feet east of; nail in root of oak tree at left edge of road	1, 864. 34
Blairsville, just west of, at fork of Culberson road; nail in root of oak tree.	1, 917. 45
Blairsville; bronze tablet in corner of court-house, marked "1926"	1, 926. 129
Blairsville, ⅜ mile northwest of court-house; nail in root of tree at right of road at stream crossing	1, 853. 13
Blairsville, 1½ miles northwest of; nail in root of large oak tree at left of road	1, 898. 25
Blairsville, 2½ miles northwest of; nail in root of stump near blazed white-oak tree on right side of road	1, 827. 68
Blairsville, 3¾ miles northwest of; nail in root of oak tree on right side of road opposite fence corner	1, 870. 83
Blairsville, 4½ miles northeast of, at top of big hill above Little Ivy Log Creek; nail in root of oak tree on right of road	2, 040. 11
Little Ivy Log Creek, top of hill just northwest of; nail in root of oak tree on left of road	1, 997. 45
Napoleon, 400 feet north of large barn at; nail in root of oak tree on bank at right edge of road	1, 908. 40
Chapman's Ford, ½ mile east of fork of road to; nail in root of large oak tree immediately in front of church	1, 987. 43
Blairsville, creek crossing 8¾ miles northwest of; nail in root of white oak tree on bank to left of road, about 135 yards from stream	1, 873. 58
Ivy Log Church; iron post, in fork of Murphy and Culberson roads, marked "1949"	1, 948. 664

	Feet.
Ivy Log Church, ½ mile west of; nail in root of large oak tree on right of road at crossing of trail	1,940.68
Ivy Log Church, 1 mile west of; nail in root of large oak tree at right edge of road in bend just beyond steep rise in road	1,833.54
Nottely River, west end of bridge across; nail in top of stump in fence corner on right of road	1,643.20
Ivy Log, 2⅞ miles west of; nail in root of small oak tree 20 feet to left of road and 500 feet from top of hill	1,807.42
Ivy Log, 4 miles northwest of; nail in root of oak tree at intersection of trail on right, just beyond house on top of hill	1,740.48
Ivy Log, 5 miles northwest of; nail in root of large post oak on bank to left of road in bend	1,798.97
Ivy Log, 6 miles northwest of; nail in root of oak tree 20 feet to left of road	1,638.28
Culberson, 1½ miles east of; nail in root of oak tree on left side of road about 120 yards from crossing of creek	1,622.02
Culberson, crossing of creek 1½ miles east of; rock on right of road about 700 feet beyond stream; copper bolt, marked "U.S.G.S. 1,617 Ft. B.M."	1,617.327
Culberson, ½ mile east of; nail in root of white oak tree on left of road at fork to Murphy	1,786.96
Culberson depot, 1,100 feet north of, and 100 feet from cattle guard; nail in top of small stump about 40 feet to right side of track	1,661.99

CULBERSON TO MINERAL BLUFF, ALONG RAILWAY.

Sweetgum Railroad Station, crossing at; nail in root of sweet-gum tree about 50 feet from track, on side of road	1,713.73
Sweetgum, lane crossing railroad about 1 mile south of station; nail in trunk of apple tree about 50 feet to left of track	1,742.57
Mineral Bluff, 2 miles north of; ledge of slate rock 250 feet from track on right side of road crossing railroad; copper bolt marked "U.S.G.S. 1702. B.M."	1,702.302

GEORGIA AND ALABAMA.

FLOYD, CHATTOOGA, AND POLK COUNTIES, GEORGIA, AND CHEROKEE COUNTY, ALABAMA.

ROME AND FORT PAYNE QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the coping of the steps on the north side of the Rome city post-office, marked "U. S. Geological Survey. 627 feet. B. M." The elevation of this bench mark was accepted as 627.560 feet above mean sea level, as based on spirit levels by the United States Engineer Corps adjusted through from mean sea level at Brunswick, Georgia. The leveling was done under the direction of Mr. M. Hackett, topographer, by Mr. J. A. McDonough, levelman.

ROME.

	Feet.
Rome, Second Avenue Bridge crossing Oostanaula River; zero of gage established by U. S. Army Engineers	576.41
Rome, First avenue and First street; top of fire plug	609.19
Rome, Southern Railway Bridge over Etowah River; rock 12 feet from south end of bridge	616.63

	Feet.
Rome, Floyd County court-house; coping of wall at southeast corner of main entrance	625.50
Rome post-office building; bronze tablet in coping of steps on north side of building, marked "627"	627.56
East Rome, Southern Railway depot; top of rail opposite center of building	624.41

ROME TO CRYSTAL SPRINGS VIA ARMUCHEE.

Summerville and Dalton, forks of roads to, at sign reading "Summerville 22 miles, Dalton 36 miles;" nail in root of pine tree	625.23
Aycock's house; nail in stump in front of	669.48
Rome, 3½ miles north of; iron post in W. L. Aycock's front yard, 100 feet south of his blacksmith shop on east side of road at road forks, marked "636"	635.979
Armuchee; nail in top of stump opposite post-office	627.83
Armuchee; iron post in John W. Selman's front yard, 20 feet southeast of house, marked "632"	632.15
Crystal Spring, forks of road to Texas Valley; nail in root of large oak tree	644.30

CRYSTAL SPRINGS, VIA KARTAH, TO SUMMERVILLE.

Old Dirt Town; nail in root of large oak tree east side of road just south of fence	677.24
Tidings, 100 feet south of; nail in root of oak tree 75 feet north of Vose's house	667.28
Kartah; iron post northwest corner of J. M. Kendrick's front yard, marked "702"	702.108
Kartah, ½ mile north of, opposite Scott's house; nail in root of large oak tree 30 feet east of road near top of hill	746.34
Summerville, 7¾-mile board from; nail in root of large sweet-gum tree on east side of road 50 feet south of branch at mile-board	677.26
Owing's (W. H.) yard; nail in root of large oak tree 20 feet north of corner of fence	702.83
Gore; nail in root of large oak tree west side of road 200 feet from cross-roads	732.69
Taylor Ridge, 75 feet northwest of summit of; nail in root of small black-oak tree	1,041.34
White's (A. M.) house at bend in road where road forks; nail in root of persimmon tree	756.68
Summerville, 1½ miles southeast of; nail in root of hickory tree west side of road near Chattooga River bridge	640.02
Summerville, Arrington building; end of step at iron column corner door of drugstore	666.82
Summerville, John S. Cleghorn & Co. store; doorstep at iron column	664.42
Summerville, Chattooga County court-house; bronze tablet in southeast corner of building, marked "668"	668.014

ROME, WESTWARD ALONG CHATTANOOGA, ROME AND COLUMBUS RAILROAD, VIA LAVENDER, TO CRYSTAL SPRINGS.

Alabama pike, 100 feet north of crossing of trestle over; nail in root of black-oak tree	601.87
Chattanooga, Rome and Columbus Railroad and Rome and Decatur Railroad crossing; nail in root of pine tree 75 feet north of	617.32
Berryhill's (J. S.) house, forks of road at; nail in root of water-oak	667.49

	Feet.
Chattanooga, Rome and Columbus Railroad; bench mark of old survey, marked "465.29" on oak tree	659.95
Lavender, J. F. Maples', near station and west of schoolhouse; iron post near front gate, east side of yard, marked "697"	697.702
Lavender, trestle at; point of stone in ditch on north side of track, 133 feet from east end of trestle	677.53
Lavender, 1 mile west of, at road forks; nail in root of small oak tree north of road	710.28
Fouche, schoolhouse on side of road south of; nail in root of black-oak tree south of schoolhouse	715.45
Fouche post-office, Floyd County; iron post in southwest corner of front yard of G. W. Milum, postmaster, marked "742"	741.563
Espey's shop, bend in road above branch just south of; nail in root of water-oak tree	710.24
Crystalsprings, 1 mile south of, at crossing of Texas Valley road and road across Lavender Mountain from Crystalsprings to Rome; iron post in east side of W. T. Freeman's front yard, marked "660"	680.428
Crystalsprings, fork of road at; nail in root of large oak tree	644.30

SPRITE SWITCH, ONE MILE WEST OF LAVENDER, NORTH ALONG CHATTANOOGA, ROME AND COLUMBUS RAILROAD TO SUMMERVILLE VIA HOLLAND'S STORE.

	Feet.
Sprite Switch; nail in root of oak tree on east side of road opposite fence corner	692.61
Tulip post-office, at Sprite Switch, on Chattanooga, Rome and Columbus Railroad; iron post, west side of gate in J. P. Bonshilon's front yard, marked "710"	709.799
Chattooga, Rome and Columbus Railroad 60-mile post; rock 20 feet south of stock gap on curve	737.28
Holland's house, west side of road in front of; nail in root of large oak tree.	672.64
Holland's store, 100 feet north of; nail in root of large oak tree east side road	677.72
Holland's, 1 mile north of; nail in root of small double oak tree at forks of road at pond	738.68
Holland's, ¾ mile north of, at Big Pond; nail in root of large oak tree east side of road at summit in front of and 125 feet southwest of small church.	828.71
Taliaferro, ¼ mile south of; nail in root of oak stump on west side of road 400 feet south of Campbellite church	690.89
Taliaferro (J. N.) garden, nail in root of cedar tree in front of; 30 feet south of corner of yard fence at Taliaferro station, Chattanooga, Rome and Columbus Railroad	637.91
Chattooga River bridge, ½ mile southeast of, at house on top of hill; nail in root of double oak tree 100 feet southwest of corner of yard fence	661.96
Lyerly; iron post in northwest corner of A. McLeod's front yard on main Summerville road; marked "658"	657.544
Lyerly, ¼ mile north of; at house of E. A. Hammond (colored) nail in root of sawed-off oak tree on west side of road 100 feet south of gate in front of lavender bush	668.22
Summerville, 5½ miles south of; nail in root of large oak tree on west side of road opposite barn	674.17
Strong's house, 150 feet east of; nail in root of large oak tree west side of road	678.76
Summerville, 3 miles south of; nail in root of large water-oak east side of road 180 feet south of milepost "S.V. 3"	649.35

SUMMERVILLE, VIA ALPINE AND BROOMTOWN, TO CEDAR BLUFF.

	Feet.
Summerville, 2 miles south of; nail in root of oak tree west side of road 100 feet south of milepost	711.92
Raccoon Creek ford, 800 feet west of; nail in root of white-oak tree north side of road	666.94
Raccoon Creek ford, ½ mile west of, at crossroad; iron post marked "681".	681.067
Summerville and Dirttown Valley roads, forks of; nail in root of hickory tree with signboard	764.17
Alpine, 1 mile east of; nail in root of large oak tree north side of road 160 feet west of milepost	781.60
Alpine, ½ mile west of, on Menlo road; nail in root of large oak tree at bend of road	750.21
Chattanooga Southern Railway crossing of Alpine-Menlo road, 225 feet north of; nail in root of oak tree west side of road	783.38
Alpine, crossroads at; iron post, in southwest angle 75 feet from large oak tree, marked "783"	783.525
Berry Spring, 100 feet south of; nail in root of oak tree at fork of road	714.79
Fort Payne, crossroad to; nail in root of large oak tree 150 feet north of church	731.05
New Moon; nail in root of large tree at rear end of store	671.43
New Moon, ¼ mile south of; nail in root of oak tree north side of road at summit	741.63
Broomtown, ¼ mile north of, at Dr. Shamblin's house; nail in root of oak tree 100 feet southwest of corner of yard fence	700.44
Broomtown; iron post, at crossroads, marked "693"	693.233
Broomtown, ½ mile south of, at fork of road east into woods, 200 feet south of milepost; nail in root of stump	671.03
Dirtseller Mountain, road up west side of; nail in root of black-oak tree north side of road opposite large white-oak tree	751.52
Schoolhouse, 100 feet south of summit; nail in root of oak tree southwest side of road	681.41
Gaylesville, 2¾ miles north of; nail in root of walnut tree west side of road.	621.72
Gaylesville, junction of Alpine and Summerville roads; nail in root of small oak tree 60 feet south of	600.56
Gaylesville, ¾ mile south of, on Rome road; copper bolt in rock on west side of road, marked "U.S.G.S. 592 Ft. B.M."	592.326
Gaylesville, 1¼ miles south of; nail in root of persimmon tree on west side of road	626.76
Cedar Bluff, 3 miles east of; nail in root of oak stump south side of road 600 feet west of railroad crossing	614.66
"Sewells Ferry, 2 miles to;" nail in root of large oak tree at forks of road with signboard as above	617.97
Cedar Bluff, 1½ miles east of; nail in elbow of crooked pine tree north side of road	600.82
Cedar Bluff, railroad station, 300 feet east of; nail in root of double cedar tree	613.14
Cedar Bluff; nail in root of large oak tree at crossroad, center of public square	608.70
Cedar Bluff, 3 feet west of large oak tree in public square; iron post marked "608"	607.99

CEDAR BLUFF TO CAVE SPRINGS, VIA HOWELLS CROSSROADS, KEY, AND FORNEY.

Cedar Bluff, 1¼ miles south of; nail in root of large oak tree west side of road in front of large two-story house belonging to J. P. Camp	574.61
Coosa River, ¼ mile northwest of; 200 feet east of fork of road toward Howells Crossroads, nail in root of walnut tree	577.91

	Feet.
Cedar Bluff, 3½ miles southeast of; nail in root of oak tree south side of road 400 feet west of summit	618.24
Howells Crossroads, 300 feet east of; nail in root of oak tree north side of road	593.62
Howells Crossroads, ½ mile south of; nail in root of sweet-gum tree west side of road at bend in small patch of woods	579.15
Howell post-office, iron post by tree in front of, marked "594"	594.013
Rock Run and Abernathy's Mill roads, ¼ mile south of fork of; nail in root of white-oak tree east side of road south of cabins on each side of road.	637.51
Wharton (Abernathy's Mill), 250 feet south of bridge over Spring Creek; nail in root of large hickory tree in bend of road	584.75
Wharton, 50 feet southwest of corner of Abernathy's Mill; copper bolt in rock 25 feet from creek and 300 feet east of bridge, marked "U.S.G.S. 583 Ft. B.M."	583.071
"Center, 10 miles to;" nail in root of large black-oak stump, bearing signboard reading as above, 100 feet east of tall pine tree in bend of road top of hill	673.05
Key, ¾ mile east of, at Weldon Sneed's house, 150 feet west of, on top of hill west of church; nail in root of large oak tree north side of road	648.34
Sand Creek, bank of; nail in root of large oak tree near, at blacksmith shop	611.17
"Cave Spring, 10 miles; Center, 12 miles;" nail in root of oak tree 20 feet north of one bearing above sign	656.36
Forney, gin on north side of road near; nail in root of elm tree at fork of road to schoolhouse	696.17
Forney, ¾ mile west of; nail in root of sweet-gum tree on east side of south fork at crossroads	739.64
Haynie post-office; nail in root of peach tree 150 feet southwest of	737.57
Haynie; nail in root of persimmon tree south side of road 150 feet east of fork of road at store	733.47
Cave Spring, 5 miles west of; nail in root of Spanish-oak tree in front of J. H. Wharton's house	733.52
Cave Spring, 4 miles west of; nail in root of white-oak tree in R. W. Richardson's front yard, west side of walk	698.99
Cave Spring, 3½ miles west of; nail in root of red-oak tree on south side of road in bend near house just east of small steep hill	709.12
Cave Spring, 1½ miles west of, between Lumpkin's house and graveyard and 100 feet west of branch between; copper bolt in limestone ledge north side of road, marked "694"	694.327
Cave Spring, ¾ mile west of, near Miller's house; nail in root of oak tree north side of road, 50 feet west of hickory tree at fork of road to Thomas Mill and Livingston	704.79
Cave Spring; nail in root of large maple tree in front of Presbyterian church	669.28

ROME TO CAVE SPRING, VIA SIXMILE AND BRISCOE.

New Rome furnace; brick foundation under iron column next to west end on north side of cast house	623.39
Sixmile; nail in root of slippery-elm tree between railroad track and Sander's store	703.25
Sixmile; iron post in D. B. Sander's front yard north side of house near fence, marked "713"	713.414
Sixmile, 4 miles south of, on Rome and Cedartown road; in front of J. F. Anglin's house; iron post marked "858"	858.044

	Feet.
Beams Spring, ¼ mile north of; nail in root of white-oak tree on west side of road, 15 feet south of crossing of mill race	780.13
Lake Creek, south of, on east side of road, near large spring; nail in root of large oak tree inside of gate at Beam's house	787.35
Cedartown, 3 miles northeast of, on "Middle Rome" road, in Mrs. M. E. Lawson's yard; iron post, marked "907"	907.407
Cedartown, 3 miles northwest of; nail in root of large oak tree in front of house on north side of road, ⅛ mile west of fork of road to Rome	799.71
Cedartown, 3½ miles northwest of; nail in root of walnut tree 20 feet west of R. A. Ray's gate	797.90
Cave Spring, 5½ miles southeast of; iron post in R. A. Ray's front yard, between corner of house and corner of yard on east, marked "770"	770.263
Cave Spring, 3 miles southeast of; nail in root of hickory tree, north side of road, 60 feet east of large oak tree	837.37
Cave Spring, Deaf and Dumb Institute; bronze tablet in wall of building 1.29 feet above outer brick of trimming course, near corner stone of school building, marked "664"	664.679
Cave Spring, post-office and Farmers' Alliance store at northeast corner of public square; out corner of south end of doorsill	650.16

CAVE SPRING, VIA LIVINGSTON, TO LINE FROM ROME, CONNECTING ½ MILE WEST OF LAVENDER.

Alabama road, 1¼ mile north of; nail in root of large oak tree on east side of road near Harrison's stable	708.82
Fain's (Andy) barn; nail in root of oak tree at gate	657.24
Sanders's, Abe (colored), house, south of; nail in root of pine tree on west side of road 200 feet south of top of hill	660.60
Foster's mill, 100 feet south of fork of road at; nail in root of walnut tree	600.06
Foster's mill, ¾ mile north of; copper bolt in rock east side of road 300 feet north of summit of hill, marked "U.S.G.S. 630 Ft. B.M."	630.161
Livingston, 1¼ miles south of; nail in root of small black-oak tree by garden fence, south of double log house on west side of road	643.02
Livingston, corner of old warehouse, 200 feet north of store and post-office; tree at corner opposite road turning west, nail in root	687.78
Evans's barn, 40 feet southeast of; nail in root of oak tree by shed	612.80
Neal Ferry, ½ mile south of, at fork of road; nail in root of large oak tree by shed across road from Garrett's house	601.53
Neal Ferry, house opposite gate to; nail in root of cedar tree near corner of fence	598.84
Coosa post-office, nail in root of oak tree in front of	616.11
Coosa schoolhouse, ¾ mile east of; nail in root of large tree	606.99
Lavender, 1¼ miles south of; nail in root of oak tree between two houses at road eastward	643.60

LIVINGSTON WEST TO ANNIEDELLE.

Livingston, nail in root of tree at corner 200 feet north of post-office and store; corner of old warehouse opposite road turning west	687.61
Livingston, 1½ miles west of; nail in root of small oak tree north side of road 40 feet east of 2-story house	631.18
Livingston, 3 miles west of; nail in root of oak tree north side of road at big gate in plank fence	617.71
Sandford's house; nail in root of oak tree 60 feet west of gate	608.32
Anniedelle, 3½ miles west of Livingston; iron post in corner of yard of Sandford's house, marked "610"	610.071

DYKE'S OLD STORE, NEAR HAYNIE, TO KEY, VIA BAUXITE, ROCK RUN, EXIE, COLOMA, AND MOSHAT.

	Feet.
Dyke's store, 1 mile south of; nail in top of stump 12 feet north of persimmon tree in fence row by tobacco patch	760.15
Warwhoop Bauxite Mine, just south of; nail in root of oak tree 15 feet south of well at point where old road turned to west	1,038.14
Bauxite, A. T. Terry's front yard; iron post, marked "1072"	1,071.814
Rock Run, 1 mile northeast of; nail in root of black-oak tree between macadamized track and road south of it	799.00
Rock Run Furnace, ¼ mile east of; nail in root of oak tree south side of road 250 feet west of well	764.68
Rock Run Iron and Mining Company, office of; iron post, in yard of store, by fence just north of entrance to office, marked "754"	754.312
Rock Run Furnace, 175 feet west of corner of; nail in root of eastern of two water-oaks 8 feet apart in yard, near fence on south side of road to Exie.	739.64
Rock Run Furnace, 1⅜ miles west of, toward Exie; nail in root of red-oak tree on bank west of road, 200 feet west of bend at foot of hill	755.70
Rock Run, 4 miles west of, on road to Exie; nail in root of oak tree in bend of road, 100 feet north of summit of road over Craig Mountain	841.78
Firestone Branch, north side of road between shop and branch; nail in root of elm tree 500 feet west of crossing of road to northwest	640.23
"Center, 8 miles to;" nail in root of sycamore tree 1,000 feet west of road junction and 300 feet west of cabin on north side of road, 100 feet east of poplar tree bearing above sign	607.83
Sandifor's (J. M.) front yard; nail in root of cedar tree	597.08
Old Coloma, 2 miles north of and 5 miles west of Exie, at forks of road from Center to Piedmont and Spring Garden; copper bolt, marked "U.S.G.S. 597 Ft. B.M.," in ledge of limestone just outside of fence, 15 feet northwest of cedar tree and 50 feet from J. J. Scruggin's house (occupied by J. M. Standifor), near church	597.478
Coloma post office; nail in root of oak tree on east side of road, 150 feet north of slough	579.32
Coloma, 1¼ miles south of, at turn of road to east; nail in root of oak tree 60 feet south of house on land of Rock Run Iron and Mining Company, near Barron's farm on west	602.46
Barron's house, 1,000 feet north of; nail in root of oak tree, east side of road, at bend	583.60
Moshat, foot of hill south of; nail in root of oak tree, east side of road, near bars in front of house	609.64
Moshat, crossing of Cave Spring, Center, and Cedar Bluff roads; iron post in northeast corner of front yard, marked "677"	677.344
Moshat crossroads; nail in root of large black-oak tree on south side of road	674.36
Moshat, 1 mile west of, at main summit between Moshat and Bomar; nail in root of pine stump, south side of road, 60 feet west of tall pine tree on north side and 300 feet from small house on south side, near top of hill	716.53
Key, 1¼ miles west of and ¼ mile east of Cowan Creek; nail in root of black-oak tree on north side of road, 40 feet west of shed	587.39

CENTRAL SECTION OF TOPOGRAPHY.

In this section, under the general direction of Mr. John H. Renshawe, topographer in charge, seven leveling parties were engaged during the entire season in running lines of spirit levels for the control of the topographic work in the various localities.

ILLINOIS.

WHITESIDE, HENRY, AND ROCK ISLAND COUNTIES.

CLINTON QUADRANGLE.

The elevations in the following list are based on the Mississippi River Commission bench mark at Albany, a copper bolt in the west side of the southwest corner of foundation of brick store occupied by Hopper & Son, and marked "U.S.P.B.M." The elevation of this bench mark, which was accepted as the central datum point for leveling in this locality, is 594.554 feet above mean sea level. The leveling was done by Mr. G. W. Newell, levelman, under the direction of Mr. R. C. McKinney, topographer.

WHITESIDE COUNTY, ALBANY TOWNSHIP.

	Feet.
Section 1, T. 20 N., R. 2 E. 4th Pr. M., ½ section line, on south line; iron post marked "678"	678. 161

WHITESIDE COUNTY, GARDEN PLAIN TOWNSHIP.

Section 36, T. 21 N., R. 2 E., near center of; flooring of bridge, junction of roads	603. 8
Section 31, T. 21 N., R. 3 E., center of; junction of roads, on large stone	650. 3
Section 32, T. 21 N., R. 3 E., center of; east end of railing of bridge, junction of roads	654. 5
Section 33, T. 21 N., R. 3 E.; junction of roads on west line of section	674

WHITESIDE COUNTY, NEWTON TOWNSHIP.

Section 6, T. 20 N., R. 3 E., near center of; junction of roads	701
Section 2, T. 20 N., R. 3 E., near northeast corner of SE. ¼ of NE. ¼, junction of roads on east line of section; iron post marked "702"	702. 174
Section 4, T. 20 N., R. 3 E., near northeast corner of, junction of roads; southeast corner hand railing of bridge	699. 6
Section 33, T. 21 N., R. 4 E.; telephone pole 100 feet north of junction of roads on south line of	604
Section 10, T. 20 N., R. 4 E.; Fenton, near ¼ section line on south line of section, where highway crosses Chicago, Burlington and Quincy Railroad	596
Section 15, T. 20 N., R. 4 E.; near south line of and on ¼ section line at junction of roads	597
Section 21, T. 20 N., R. 4 E., near northwest corner of; junction of roads at Coborn schoolhouse	614
Section 29, T. 20 N., R. 4 E., southeast corner of; junction of roads	586
Section 33, T. 20 N., R. 4 E., southwest corner NW. ¼ of NW. ¼; junction of road	586

WHITESIDE COUNTY, ERIE TOWNSHIP.

Section 6, T. 19 N., R. 4 E., near northeast corner of SE. ¼ of; where road crosses Chicago, Burlington and Quincy Railroad	586. 6
Erie, small triangular park in public square; iron post marked "587"	587. 023
Section 17, T. 19 N., R. 4 E., northwest of; highway bridge over Rock River, 21 feet above water	592. 6
Erie, first highway crossing Chicago, Burlington and Quincy Railroad south of depot; rail	584. 1

	Feet.
Section 15, T. 19 N., R. 3 E., east side of; road crossing Chicago, Burlington and Quincy Railroad	583
WHITESIDE COUNTY, PORTLAND TOWNSHIP.	
Section 17, T. 19 N., R. 4 E., near center of; junction of roads	581
Section 20, T. 19 N., R. 4 E., NW. ¼ of NE. ¼; junction of roads	593
Section 20, T. 19 N., R. 4 E., near northwest corner of NE. ¼ of SW. ¼; at junction of roads	598
Section 20, T. 19 N., R. 4 E.; junction of roads on ½ section line on south line of section	661
Section 32, T. 19 N., R. 4 E., southwest corner of NW. ¼ of SE. ¼; junction of roads	642
HENRY COUNTY, PHENIX TOWNSHIP.	
Section 12, T. 18 N., R. 3 E., northwest corner of NE. ¼ of NW. ¼, junction of roads ¼ mile west of Sharon post-office; iron post, marked "597"	596.912
WHITESIDE COUNTY, NEWTON TOWNSHIP.	
Section 2, T. 20 N., R. 3 E.; junction of roads on west section line	715
Section 2, T. 20 N., R. 3 E.; junction center of SE. ¼	723
Section 2, T. 20 N., R. 3 E., junction of roads southwest corner of SE. ¼ of SE. ¼ of; northwest corner schoolhouse yard	700
Section 1, T. 20 N., R. 3 E.; junction of roads at ½ section line on south line.	710
Section 1, T. 20 N., R. 3 E., southeast corner of; junction of roads	717
WHITESIDE COUNTY, FENTON TOWNSHIP.	
Section 6, T. 20 N., R. 4 E., ½ section line, south line, junction of roads	712
Section 5, T. 20 N., R. 4 E., southeast corner of, junction of roads; peg 30 feet east of hickory tree at northeast corner of road	635
Section 4, T. 20 N., R. 4 E., southeast corner of SW. ¼ of SE. ¼; east end of hedge fence on south line of section	615
HENRY COUNTY, LORAINE TOWNSHIP.	
Section 6, T. 18 N., R. 4 E., northeast corner of; junction of roads	639
Section 6, T. 18 N., R. 4 E., near southeast corner of, junction of roads at William Ornett's (Sharon Stock Farm); iron post marked "627"	626.816
ROCK ISLAND COUNTY, COE TOWNSHIP.	
Hillsdale, 90 feet east of north end of Chicago, Burlington and Quincy Railroad depot; iron post marked "598," should be "577"	576.834
Section 31, T. 19 N., R. 3 E., southeast corner of SW. ¼ of SE. ¼; road crossing Chicago, Burlington and Quincy Railroad	577
ROCK ISLAND COUNTY, ZUMA TOWNSHIP.	
Section 1, T. 18 N., R. 2 E., SE. ¼ of; road crossing Chicago, Burlington and Quincy Railroad on east line of section	575
Section 12, T. 18 N., R. 4 E., northwest corner of SE. ¼ of SW. ¼; road crossing Chicago, Burlington and Quincy Railroad	578
Joslyn, northeast corner W. H. Whiteside's yard, by Chicago, Burlington and Quincy Railroad; iron post marked "581"	580.931
Section 23, T. 19 N., R. 2 E., southeast corner of; iron post marked "679".	679.014
Fenton, south side of sidewalk, about 100 feet west of Chicago, Burlington and Quincy Railroad; iron post marked "621;" marked wrong, should be "601"	601.046

IOWA.

DUBUQUE, JONES, LINN, AND DELAWARE COUNTIES.

MAQUOKETA AND ANAMOSA QUADRANGLES.

The elevations in the following list are dependent on the Mississippi River Commission bench mark in the northeast corner of the custom-house, a copper bolt, marked "U.S.P.B.M.," which was accepted as the central datum point for work in this neighborhood, and the elevation of which is 643.481 feet above mean sea level. The leveling was done by Mr. G. W. Newell, level man, under the direction of Mr. R. C. McKinney, topographer.

DUBUQUE COUNTY, WHITEWATER TOWNSHIP.

	Feet.
Section 31, T. 87 N., R. 1 W., near center of; point where highway crosses Chicago, Milwaukee and St. Paul Railroad	843.7
Section 31, T. 87 N., R. 1 W.; Cascade, Main street; hydrant at base of water tower	865
Section 31, T. 87 N., R. 1 W.; Cascade, Main street; top course of masonry of bridge over North Fork Maquoketa river	838.6

DUBUQUE COUNTY, CASCADE TOWNSHIP.

Section 36, T. 87 N., R. 2 W., NW. ¼ of NW. ¼; on north line of section, at junction of roads going north and west	841
Section 26, T. 87 N., R. 3 W.; North Fork Maquoketa river, nail in third board of floor of highway bridge, 15 feet above water	843.1
Section 26, T. 87 N., R. 2 W., junction of road going north on line between sections 26 and 27	848
Section 16, T. 87 N., R. 2 W., center of, at southeast corner of junction of wagon roads; iron post marked "866"	866.254
Section 17, T. 87 N., R. 2 W.; center of section and junction of road	1,022
Section 17, T. 87 N., R. 2 W., SE. ¼ of NW. ¼ of; at junction of road going northeast	1,026
Section 18, T. 87 N., R. 2 W., NW. ¼ of; where highway crosses North Fork Maquoketa River, on bridge 15 feet above water	884

DUBUQUE COUNTY, DODGE TOWNSHIP.

Section 31, T. 88 N., R. 2 W., near north line of; Worthington, southwest corner A street and Fourth avenue; iron post marked "931"	930.537
Section 28, T. 88 N., R. 2 W., on ¼ section line north of center; west cattle guard 115 feet west of highway crossing Chicago, Milwaukee and St. Paul Railroad	994
Section 22, T. 88 N., R. 2 W., on section line between sections 22 and 23, near north line of section; highway crossing Chicago, Milwaukee and St. Paul Railroad	1,053
Section 13, T. 88 N., R. 2 W., near north line of, near northeast corner section 13; highway crossing of Chicago, Milwaukee and St. Paul Railroad	1,120
Section 12, T. 88 N., R. 2 W., near southeast corner of; Chicago, Milwaukee and St. Paul Railroad crossing on township line	1,122

DUBUQUE COUNTY, TAYLOR TOWNSHIP.

	Feet.
Section 7, T. 88 N., R. 1 W., SW. ¼ of Farley, Wood street, west side, where street crosses Illinois Central Railroad; iron post marked "1117"	1,117.439
Section 6, T. 88 N., R. 1 W., center of road going west	1,109
Section 6, T. 88 N., R. 1 W., ¼ corner north line of, at road junction; iron post marked "1139"	1,139.354

JONES COUNTY, RICHLANDS TOWNSHIP.

Section 1, T. 86 N., R. 2 W., NW. ¼ of NW. ¼ of, on line between sections 1 and 2 at junction of roads going north and west; iron post marked "957"	957.238

JONES COUNTY, MONTICELLO TOWNSHIP.

Section 9, T. 86 N., R. 3 W., NW. ¼ of, between railroad tracks, about 500 feet north of switch; iron post marked "849"	849.469
Section 5, T. 86 N., R. 3 W., near northeast corner of; where Chicago, Milwaukee and St. Paul Railroad crosses county-line, Jones and Delaware counties	856
Section 32, T. 87 N., R. 3 W., southwest corner of SE. ¼ of NE. ¼; highway crossing of Chicago, Milwaukee and St. Paul Railroad on ¼ section line.	865
Section 29, T. 87 N., R. 3 W., NW. ¼ near northwest corner; on north line of section, where highway crosses Chicago, Milwaukee and St. Paul Railroad	911
Section 19, T. 86 N., R. 3 W., ¼ section line, junction of road	921
Monticello, crossing of first street south of Chicago, Milwaukee and St. Paul Railroad depot	844
Section 21, T. 86 N., R. 3 W., south line of NE. ¼, highway crossing on ¼ section line, Monticello	843
Chicago, Milwaukee and St. Paul Railroad bridge over Maquoketa River, south end of, north of Monticello, 20 feet above water	823

JONES COUNTY, WASHINGTON TOWNSHIP.

Section 7, T. 86 N., R. 1 W., NW. ¼ of, junction of road going south; iron post marked "961"	961.153

JONES COUNTY, NEW WINE TOWNSHIP.

Dyersville, about 100 feet north of east end of depot, Illinois Central Railroad; iron post marked "952"	952.149
Illinois Central Railroad bridge over Maquoketa River at Dyersville, 17 feet above water	949.6

JONES COUNTY, CASTLE GROVE TOWNSHIP.

Section 4, T. 86 N., R. 4 W., SE. ¼ of SE. ¼, south line of section; Argand post-office, corner of yard at schoolhouse; iron post marked "977"	976.673
Section 10, T. 86 N., R. 4 W., SW. ¼ of; top of railing of bridge over Silver Creek	893.5
Section 10, T. 86 N., R. 4 W., near center of SW. ¼, junction of roads at schoolhouse	941
Section 14, T. 86 N., R. 4 W., near center of; Sumner, junction of road	943
Section 14, T. 86 N., R. 4 W., southeast corner of; junction of road	960
Section 24, T. 86 N., R. 4 W., SE. ¼; top of railing on highway bridge, 11½ feet above water of creek	895.7

JONES COUNTY, UNION TOWNSHIP.

	Feet.
Section 18, T. 87 N., R. 4 W., SW. ¼ of; Hopkinton, northwest corner Main and Locust streets by Central Drug Store; iron post marked "872"	871.917
Section 11, T. 87 N., R. 4 W., near southeast corner of SE. ¼ of NE. ¼, where highway crosses Chicago, Milwaukee and St. Paul Railroad, near bridge over Maquoketa River	858

JONES COUNTY, CASTLE GROVE TOWNSHIP.

Section 4, T. 86 N., R. 4 W., southwest corner of, junction of road	946
Section 4, T. 86 N., R. 4 W., junction of roads on ½ section line	975

LYNN COUNTY. BOWLDER TOWNSHIP.

Section 10, T. 86 N., R, 5 W., northwest corner of, opposite side of road from Stromburg's residence; iron post marked "1,013"	1,013.147
Section 2, T. 86 N., R. 5 W., northwest corner of NE. ¼ of NW. ¼, junction of roads	1,045

DELAWARE COUNTY, SOUTH FORK TOWNSHIP.

Section 13, T. 87 N., R. 3 W., southwest corner of SW. ¼ of NW. ¼; between sections 13 and 14, junction of roads	989
Section 14, T. 87 N., R. 3 W., southeast corner of NE. ¼ of NE. ¼	988
Section 14, T. 87 N., R. 3 W., southwest corner of NW. ¼ of NW. ¼	943
Corner of sections 10, 11, 14, and 15, T. 87 N., R. 3 W.; iron post, marked "952"	952.364
Section 11, T. 87 N., R. 3 W.; on ½ section line where highway crosses Chicago, Milwaukee and St. Paul Railroad	969
Section 15, T. 88 N., R. 3 W., near center of; where highway crosses Chicago, Milwaukee and St. Paul Railroad on ½ section line	966
Section 22, T. 88 N., R. 3 W.; on ¼ section line near west line of section, where highway crosses Chicago, Milwaukee and St. Paul Railroad	963
Section 27, T. 87 N., R. 3 W.; Sand Springs, at creamery, highway crossing Chicago, Milwaukee and St. Paul Railroad	920

DELAWARE COUNTY, SOUTH FORK TOWNSHIP.

Section 27, T. 87 N., R. 3 W.; Sand Springs, street crossing at post office, Chicago, Milwaukee and St. Paul Railroad	910
Section 4, T. 86 N., R. 3 W., north line of; highway crossing Chicago, Milwaukee and St. Paul Railroad, county line between Delaware and Jones counties	863

DELAWARE COUNTY, NORTH FORK TOWNSHIP.

Section 36, T. 88 N., R. 3 W., near northeast corner SW. ¼ of SW. ¼, 12 feet above highway crossing Chicago, Milwaukee and St. Paul Railroad	923
Section 36, T. 88 N., R. 3 W., near center of; Maquoketa River, guard rail of bridge Chicago, Milwaukee and St. Paul Railroad 21 feet above water	913.71
Section 36, T. 88 N., R. 3 W., SE. ¼ of NE. ¼ of; where highway crosses Chicago, Milwaukee and St. Paul Railroad	911
Section 36, T. 88 N , R. 3 W., near center NE. ¼, 50 feet southeast of highway bridge over Maquoketa River; iron post marked "908"	908.134

DELAWARE COUNTY, DELHI TOWNSHIP.

Section 35, T. 88 N., R. 4 W., near northeast corner of NW. ¼ of SW. ¼, at highway crossing Chicago, Milwaukee and St. Paul Railroad	863

	Feet.
Section 27, T. 88 N., R. 4 W., near west section line of SW. ¼ of SW. ¼, where highway crosses Chicago, Milwaukee and St. Paul Railroad	911
Section 20, T. 88 N., R. 4 W., near north line of; Delhi, on east side of road, about 100 feet east of Chicago, Milwaukee and St. Paul Railroad depot; iron post marked "1016"	1,016.283
Delhi; crossing Chicago, Milwaukee and St. Paul Railroad at cemetery	1,007
Section 18, T. 88 N., R. 4 W., near center of; on ¼ section line, highway crossing Chicago, Milwaukee and St. Paul Railroad	1,032
Section 18, T. 88 N., R. 4 W., at north line of; highway crossing Chicago, Milwaukee and St. Paul Railroad	1,045
Section 7, T. 88 N., R. 4 W., at north line of; highway crossing of Chicago, Milwaukee and St. Paul Railroad	1,049
Section 6, T. 88 N., R. 4 W., at north line of; highway crossing of Chicago, Milwaukee and St. Paul Railroad	1,084

DELAWARE COUNTY, ONEIDA TOWNSHIP.

Section 32, T. 88 N., R. 4 W., SW. ¼ of; Delaware, northwest corner of street opposite post-office and Knowles Hotel; iron post marked "1089".	1,088.621
Section 36, T. 89 N., R. 4 W., NE. ¼ of; east line of (township line), trestle Illinois Central Railroad over Plumb Creek, 30 feet above water	975
Earlville; east end stock yard Illinois Central Railroad	999
Earlville; bottom step of east end depot platform Illinois Central Railroad	1,005.44
Section 36, T. 89 N., R. 4 W., on west line of; where highway crosses Illinois Central Railroad	1,014
Section 35, T. 89 N., R. 4 W., on west line of; where highway crosses Illinois Central Railroad	1,044
Section 33, T. 89 N., R. 4 W.; on ¼ section line, highway crossing Illinois Central Railroad	1,073.574
Delaware; depot Illinois Central Railroad	1,076

DELAWARE COUNTY, DELAWARE TOWNSHIP.

Section 35, T. 89 N., R. 5 W.; on ¼ section line near top, at highway crossing Illinois Central Railroad	986
Section 33, T. 89 N., R. 5 W., NW. ¼; highway crossing Illinois Central Railroad	954
Manchester; Illinois Central Railroad bridge	948.937
Manchester; 150 feet south of stock yards, on west side of Illinois Central Railroad track, and south side of street; iron post marked "949"	948.734

DELAWARE COUNTY, MILO TOWNSHIP.

Section 6, T. 88 N., R. 5 W., near southeast corner of; on south line, highway crossing Illinois Central Railroad	959
Section 7, T. 88 N., R. 5 W., NE. ¼ of; south end guard rail of bridge over Sand Creek, Illinois Central Railroad	950.1
Section 7, T. 88 N., R. 5 W., SE. ¼ of; south line of, highway crossing Illinois Central Railroad	954
Section 18, T. 88 N., R. 5 W., SE. ¼ of; south line of, highway crossing Illinois Central Railroad	965
Section 19, T. 88 N., R. 5 W., highway crossing Illinois Central Railroad on east and west ¼ section line	965
Section 31, T. 88 N., R. 5 W.; Golden, highway crossing 150 feet west Illinois Central Railroad, on ¼ section line, on north side of road and south of depot; iron post marked "1055"	1,055.086

DELAWARE COUNTY, HAZEL GREEN TOWNSHIP.

	Feet.
Section 7, T. 87 N., R. 5 W., on south line of; southeast corner of trestle on Illinois Central Railroad, 14 feet above highway	998.5
Section 18, T. 87 N., R. 5 W.; Ryan, east side road crossing Illinois Central Railroad, on west side township line, about 50 feet north of railroad; iron post, marked "1020"	1,019.701
Section 18, T. 87 N., R. 5 W., southwest corner of; junction of roads	1,046
Section 18, T. 87 N., R. 5 W., southeast corner of; junction of roads	1,013
Section 17, T. 87 N., R. 5 W., southeast corner of; junction of roads	995
Section 16, T. 87 N., R. 5 W., southeast corner of; junction of roads	976
Section 22, T. 87 N., R. 5 W., on west side of; ½ section line	1,018
Section 22, T. 87 N., R. 5 W., southeast corner of; junction of roads	1,042
Section 33, T. 87 N., R. 5 W.; bolt in northwest corner of highway bridge.	1,018.6
Section 33, T. 87 N., R. 5 W., southwest corner of; junction of roads on county line Linn and Delaware	1,021

DELAWARE COUNTY, BREMEN TOWNSHIP.

Section 36, T. 89 N., R. 3 W., north line of; road crossing Illinois Central Railroad	950
Section 35, T. 89 N., R. 3 W.; ½ section line, highway north from Illinois Central Railroad	956
Section 28, T. 89 N., R. 3 W., southeast corner of; road going north from Illinois Central Railroad	989
Section 33, T. 89 N., R. 3 W., NW. ¼, near north line of; where highway goes south from Illinois Central Railroad; iron post marked "1022"	1,021.751

DUBUQUE COUNTY.

Center Grove bridge, over North Fork Catfish Creek, top of guard rail, northeast corner of, on Delhi road, between Dubuque and Center Grove.	734.5
Center Grove; highway bridge over Catfish Creek, nail in first plank of floor	730.5
Illinois Central Railroad; bridge No. 19 over Catfish Creek, nail in east end south guard rail	687.22
Illinois Central Railroad; crossing of North Cascade road, nail in east end north plank	671.25
Dubuque, junction Dodge street with North Cascade road, curbstone at lamp-post	840.97
Dubuque, Grand River avenue and Dodge street, northeast corner of; iron post marked "875"	475.152
Rockdale, Tablemount Township; bridge No. 8, Illinois Central Railroad, nail south end west guard rail	618.56
Ballyclough and King post-office (Davenport and Bellevue) roads, northwest corner rock abutment of culvert at junction of	717.35
Section 6, T. 88 N., R. 3 E., first bridge east of Rockdale on Bellevue road over Granger Creek, southwest corner abutment of	621.3
Section 7, T. 88 N., R. 3 E., southwest corner SE. ¼, NE. ¼ at junction of road going south	668
Section 8, T. 88 N., R. 3 E., junction of road going east to Massey Station	727
Section 21, T. 88 N., R. 3 E., on road going northeast to Massey Station	1,137
Section 28, T. 88 N., R. 3 E., NE. ¼ of, road going south from near center of.	1,115
Section 27, T. 88 N., R. 3 E., near center NW. ¼ of, on road going north to Massey Station	1,128
Section 27, T. 88 N., R. 3 E., near center NE. ¼ of St. Katherine's Church, northwest corner yard of priest's house; iron post marked 1123	1,122.551

	Feet.
Section 11, T. 88 N., R. 2 E., SE. ¼ of, Keywest, junction of road going south to cemetery gate	841
Section 11, T. 88 N., R. 2 E., SW. ¼ of, road going west from Ballyclough road ¼ mile west Keywest	953
Section 15, T. 88 N., R. 2 E., SW. ¼ of, Ballyclough post-office, south side road, 66 feet west from corner of porch; iron post marked 1071	1,070.219
Section 15, T. 88 N., R. 2 E., SW. ¼ of, south section line at Ballyclough post-office, road going west to North Cascade road	1,068
Section 22, T. 88 N., R. 2 E., southwest corner NW. ¼ of, on road going south on line between sections 21 and 22	1,089
Section 21, T. 88 N., R. 2 E., near south line of, on road going south on ½ section line	1,115
Section 29, T. 88 N., R. 2 E., on road running west near center of	1,124
Section 31, T. 87 N., R. 2 E., on road running east and west along north line township	1,081
Section 1, T. 87 N., R. 1 E., Prairie Creek Township, on road going west on half section line	1,103
Section 1, T. 87 N., R. 1 E., southeast ¼ of, on road running east, near center of	1,101
Section 12, T. 87 N., R. 1 E., southwest corner NW. ¼ NW. ¼ of, road going west from	1,080
Section 11, T. 87 N., R. 1 E., SE. ¼ of, northeast corner of frame building, which was at one time a saloon, at junction of roads going south (formerly Melleray post-office, commonly called "The Corners"); iron post marked "1065"	1,065.415
Section 14, T. 87 N., R. 1 E., northeast corner NE. ¼ NW. ¼ of, on road running south from	1,052
Section 16, T. 87 N., R. 1 E., on road running south on ½ section line, near south line of	987
Section 16, T. 87 N., R. 1 E., near southwest corner SW. ¼ of, on road running north, between sections 16 and 17	974
Section 20, T. 87 N., R. 1 E., southeast corner of NE. ¼ of NW. ¼, on road going west from	993
Section 20, T. 87 N., R. 1 E., near center of, on road running southeast	1,024
Section 19, T. 87 N., R. 1 E., on road running west, at ½ section line, near south line of	975
Section 30, T. 87 N., R. 1 E., on ½ section line of, road crossing Chicago, Milwaukee and St. Paul Railway (narrow gauge), west cattle guard; nail in north end, third tie from	900.84
Section 25, T. 87 N., R. 1 W., Whitewater Township, road-crossing Chicago, Milwaukee and St. Paul Railway (narrow gauge) at half-section line of; nail in north end second tie from east cattle guard, iron post marked "889"	889.232
Section 29, T. 87 N., R. 1 E., SW. ¼ of, road-crossing Chicago, Milwaukee and St. Paul Railway (narrow gauge), Prairie Creek Township	943
Section 27, T. 87 N., R. 1 E., road-crossing at Bernard, on ½ section line; nail in south end of tie on main track 88 feet west of toe of switch on Chicago, Milwaukee and St. Paul Railway	930.14
Sections 34 and 35, T. 87 N., R. 1 E., north and south line between where railroad crosses wagon road	954
Section 35, T. 87 N., R. 1 E., south line of. At road-crossing Chicago, Milwaukee and St. Paul Railway on county line between Dubuque and Jefferson counties, point on rail about 100 feet west of	948.25
Section 36, T. 87 N., R. 1 E., near southwest corner of, road-crossing Chicago, Milwaukee and St. Paul Railway	807

	Feet.
Section 32, T. 87 N., R. 2 E., Washington Township; nail in railroad tie at road crossing on ½ section line	1,051.07
Section 33, T. 87 N., R. 2 E., railroad crossing, Syloa	1,072
Section 33, T. 87 N., R. 2 E., road-crossing at ½ section line, nail in south end railroad tie	1,069.07
Section 34, T. 87 N., R. 2 E., 130 feet from joint of north rail Chicago, Milwaukee and St. Paul Railway, at road-crossing on county line south side of above section	909.15
Section 2, T. 86 N., R. 2 E., road-crossing Chicago, Milwaukee and St. Paul Railway, near west section line, 10 feet south railroad track, Otter Creek Township; iron post marked "921"	921.155
Section 1, T. 86 N., R. 1 E., south side road which crosses Chicago, Milwaukee and St. Paul Railway on north line of; fence corner near William Cannon's gate 20 feet southeast of cattle guard, Butler Township; iron post marked "868"	868.234
Section 35, T. 35 N., R. 2 E., road-crossing on county line between Dubuque and Jackson counties, joint west rail Chicago, Milwaukee and St. Paul Railway at cattle guard, Washington Township	930.40
Section 35, T. 87 N., R. 2 E., Zwingle Station, Chicago, Milwaukee and St. Paul Railway, west end platform; iron post marked "902"	902.130
Section 31, T. 87 N., R. 3 E., west cattle guard at ½ section line second rail-joint west of	1,014.83
Section 6, T. 86 N., R. 3 E., north side of; nail in north end middle plank at road-crossing	957.6
Section 4, T. 86 N., R. 3 E., La Motte Station, nail in plank at southwest corner sidewalk; iron post marked "923," Jackson County, Richland Township	923.5
Section 3, T. 86 N., R. 3 E., road-crossing southwest corner of, nail in south end plank at culvert	996.9
Section 10, T. 86 N., R. 3 E., schoolhouse No. 2, lower course of masonry, northwest corner of	1,093.7
Section 34, T. 87 N., R. 3 E., south side of road-crossing Chicago, Milwaukee and St. Paul Railway, on ½ section line, Dubuque County, Prairie Spring Township	1,033
Section 27, T. 87 N., R. 3 E., point on ½ section road, 200 feet north of south boundary	1,037
Section 22, T. 87 N., R. 3 E., Nat Mandor's shed southeast corner of, west side of road, 200 feet southwest from bridge over Tête des Morts River, on ½ section line; iron post marked "718"	717.983
Section 15, T. 87 N., R. 3 E., junction of road running west, Dubuque County, Prairie Springs Township	760
Section 3, T. 87 N., R. 3 E., junction of road in SE. ¼ of	1,043.124
Section 2, T. 87 N., R. 3 E., north side of, junction of road on county line (Jackson and Dubuque)	742
Section 35, T. 88 N., R. 3 E., NW. ¼ of, iron bridge on road	809
Section 35, T. 88 N., R. 3 E., SE. ¼ of, junction of road running west, Dubuque County, Mosalem Township	756
Section 29, T. 89 N., R. 2 E., north and south road-crossing Illinois Central Railroad, near south line of	786
Illinois Central Railroad track, point on rail just west of Julien, on overhead bridge across road along township line between Ranges 1 and 2 E., Townships 8 and 9 N	854.60
Section 36, T. 89 N., R. 1 E., east and west road-crossings Illinois Central Railroad near railroad fence, north side of wagon road, 50 feet west of railroad track, Dubuque County, Center Township; iron post marked "869"	869.231

	Feet.
Section 26, T. 87 N., R. 1 W.; railroad bridge No. 890 over Whitewater Creek just west of Fillmore, Chicago, Milwaukee and St. Paul Railway; east end south guard rail, Whitewater Township	830.8
Section 28, T. 87 N., R. 1 W.; east side of road crossing Chicago, Milwaukee and St. Paul Railway	1,016
Section 29, T. 87 N., R. 1 W., NE. ¼ of NE. ¼ of; joint of rail under overhead road crossing Chicago, Milwaukee and St. Paul Railway	974.42
Section 6, T. 86 N., R. 4 E., SW. ¼ of; junction of wagon roads, near Anton Ernest's house, Jackson County, Bellevue Township; iron post marked "708"	708.094
Section 7, T. 87 N., R. 4 E., near center of; opposite St. Donatus post-office; iron post marked "674"	674.186
Section 10, T. 88 N., R. 1 E., on north line of; road crossing Illinois Central Railroad, Dubuque County, Vernon Township	1,009
Section 9, T. 88 N., R. 1 E., Peosta station, Illinois Central Railroad, 25 feet northwest of; fifty feet north of main track in wagon road; iron post marked "1051"	1,050.782
Section 7, T. 88 N., R. 1 E., east line of; fourth joint of west cattle guard rail, Illinois Central Railroad, at road crossing	1,072.20
Section 7, T. 88 N., R. 1 E., west line of; road crossing Illinois Central Railroad	1,062
Section 12, T. 88 N., R. 1 W.; trestle 15 feet above wagon road junction, ¼ mile east of west line of section; milepost Illinois Central Railroad 201 miles west of Chicago	1,043
Section 11, T. 88 N., R. 1 W.; road crossing Illinois Central Railroad, near east line of	1,045
Stockyards at Epworth; road crossing at	1,048
Section 10, T. 88 N., R. 1 W., west line of; second joint west of west cattle guard at road crossing	1,044
Section 9, T. 88 N., R. 1 W.; road crossing near center of	1,055
Section 8, T. 88 N., R. 1 W., west side of; road crossing on section line	1,053.7

MISSOURI.

JEFFERSON, FRANKLIN, WASHINGTON, AND ST. FRANCOIS COUNTIES.

DE SOTO QUADRANGLE.

The elevations in the following list are based on a bronze tablet in the foundation of the opera-house building at De Soto, Missouri, and marked "508." The initial height on which the leveling in this locality rests is a United States Coast and Geodetic Survey precise-level bench mark at De Soto, connected with the Mississippi River Commission bench mark $\frac{\text{“45”}}{3}$ at Riverside, Missouri. From these data the elevation of the central datum point is accepted as 507.779 feet above mean sea level. The leveling is by Messrs. A. F. Montmorency and C. H. Dana, levelmen, under the general direction of Mr. Paul Holman, topographer.

JEFFERSON COUNTY.

	Feet.
Section 7, T. 43 N., R. 5 E., NE. ¼ of; on Gravois road 3 miles north of High Ridge, at junction of road to Valleypark; iron post marked "714".	713.635
Section 14, T. 43 N., R. 4 E., SE. ¼ of; on road opposite High Ridge post-office; iron post marked "926"	926.225

	Feet.
Section 4, T. 42 N., R. 4 E., NE. ¼ of; north end of east abutment of bridge across Hedge Creek at Houses Springs; bronze tablet marked "465"	465.465
Section 13, T. 42 N., R. 4 E., NW. ¼ of; on road opposite schoolhouse on Antonia road, 3 miles southeast of Houses Springs	593
Section 18, T. 42 N., R. 5 E., SE. ¼ of; 200 yards south of St. Paul's Church on road from Houses Springs to Antonia; iron post marked "881"	881.083
Section 18, T. 42 N., R. 4 E., SE. ¼ of; summit of ridge 1 mile northeast of Local, on Gravois road	788
Section 18, T. 42 N., R. 4 E., in SW. ¼ of; road in front of store at Local	481
Section 12, T. 42 N., R. 3 E.; near center of southwest abutment of iron bridge over Big River at Byrnesville; copper bolt marked "459"	459.405
Section 28, T. 42 N., R. 4 E., in NW. ¼ of; on road to Hillsboro, at summit of Divide, 2½ miles south of Houses Springs	800
Section 10, T. 41 N., R. 4 E., in SW. ¼ of; Bellews Creek post-office; iron post marked "708"	708.363
Survey 359, T. 42 N., R. 3 E., near southeast corner of; floor of west end of bridge across Big River at Cedar Hill	473
Section 19, T. 41 N., R. 5 E., SE. ¼ of; in rock on road 175 feet south of Jarvis post-office; copper bolt marked "530"	530.293
Section 12, T. 41 N., R. 3 E., SW. ¼ of; floor of bridge across Jones Creek, 1¼ miles north of Morse Mills, on Gravois road	490
Survey No. 871; In north abutment of bridge over Big River at Morse Mills; bronze tablet marked "494"	494.157
Section 30, T. 41 N., R. 4 E., SW. ¼ of; on road from Hillsboro to Morse Mills, at cross roads, 2¼ miles southeast of Morse Mills	796
Section 3, T. 40 N., R. 4 E.; in corner stone of county court-house, Hillsboro; bronze tablet marked "801"	801.468
Section 5, T. 40 N., R. 4 E., SE. ¼ of; nail in stump at forks of road to Morse Mills, 2 miles west of Hillsboro	843.5
Section 2, T. 40 N., R. 4 E., near southwest corner of; nail in telegraph pole at forks of road to Hematite, 1¼ miles southeast of Hillsboro	817.6
Section 11, T. 40 N., R. 3 E., near center of; in sandstone ledge on north bank of Dry Creek near Ware post-office; copper bolt marked "552"	551.523
Section 19, T. 40 N., R. 5 E., in northeast corner of; 1 mile north of Victoria Station, in north abutment of bridge No. 28 on St. Louis, Iron Mountain and Southern Railway; copper bolt marked "451"	450.665
Survey No. 894, near center of; nail in doorsill at southeast corner of Victoria Station	465.8
De Soto, Missouri, southeast corner of foundation of opera-house building; bronze tablet marked "508"	507.779
Section 5, T. 39 N., R. 4 E., in NW. ¼ of; nail in stump at junction of Richwoods and Ware roads, 3¼ miles west of De Soto	852.6
Section 33, T. 40 N., R. 3 E., NE. ¼ of; nail in stump 100 feet south of Frumet post-office	573.7
Section 10, T. 39 N., R. 4 E., near northwest corner of rock at junction of Valle Mines and Vineland roads, 1 mile south of De Soto	509
Section 30, T. 39 N., R. 5 E., near southeast corner of; at road junction	634
Section 5, T. 38 N., R. 5 E.; top of rail opposite center of Valle Mines station	742.8
Section 5, T. 38 N., R. 5 E., near center of; 50 feet east of depot at Valle Mines station; iron post marked "745"	744.756
Section 20, T. 39 N., R. 4 E., near northwest corner of; spike in tie opposite center of depot at Vineland station	693.8
Section 27, T. 43 N., R. 3 E., near center of; rock on road from Pacific to Byrnesville, near Wilson's house; copper bolt marked "479"	478.784

	Feet.
Section 16, T. 42 N., R. 3 E., near center of; road in front of Sheve post-office	648
Section 34, T. 42 N., R. 3 E., in NE. ¼ of; southwest corner of stone in gate at Dittmer post-office	589.2
Section 15, T. 41 N., R. 3 E., in SW. ¼ of; Jones Creek, at road crossing on road from Morse Mills to Grubville	545
Section 29, T. 41 N., R. 3 E., SE. ¼ of; road in front of cemetery on road from Ware to Grubville, 4¼ miles northwest of Ware	618
Survey No. 3053, near northeast corner of; water level of Big River, at ford on road from Ware to Grubville, 2¼ miles northwest of Ware	486
Survey No. 1946, near west corner of; floor of east end of iron bridge over Meramec River, 1 mile south of Pacific	462
Section 30, T. 39 N., R. 5 E., near southeast corner of, ledge of rock 300 feet east of Coles Mill, 2½ miles northwest of Valle Mines Station; copper bolt marked "646"	646.259

FRANKLIN COUNTY.

Section 26, T. 43 N., R. 1 W., in SW. ¼ of; capstone southeast corner of stone bridge over Flat Creek, ½ mile east of Union; bronze tablet marked "516"	515.809
Section 14, T. 43 N., R. 1 W., NE. ¼ of; road at fork on Rock road 3 miles north of Union, near church	759
Section 16, T. 43 N., R. 1 E., SW. ¼ of; 4 feet south of United States Coast and Geodetic Survey monument "Halleck;" iron post marked "789"	789.251
Section 11, T. 43 N., R 1 E., southwest corner of; spike at northeast corner of bridge at crossing of Rock road over railroad	704.4
Section 7, T. 43 N., R. 2 E., near southeast corner of; on Rock road at fork to Robertsville, 1½ miles southwest of Greys Summit	695
Section 8, T. 43 N., R. 2 E., in NW. ¼ of; top of rail opposite center of depot Missouri Pacific Railroad at Greys Summit	631.993
Section 12, T. 43 N., R. 2 E., in northeast corner of; southeast corner of foundation L. E. Roemer's store on Main street, two doors east of post-office, Pacific, Missouri; bronze tablet marked "466"	465.645
Section 33, T. 43 N., R. 1 E., SE. ¼ of; at crossroads on Moselle and Union road, 5¼ miles east of Union	641
Section 8, T. 42 N., R. 1 E., near northeast corner of SE. ¼ of; at fork in Union and Moselle road, 2 miles northwest of Moselle	684
Section 15, T. 42 N., R. 1 E., in NW. ¼ of; top of rail opposite center of Moselle depot	493.1
Section 26, T. 42 N., R. 1 E., near center of; capstone of northwest abutment of iron bridge over Meramec River, 3½ miles southeast of Moselle on main road to Grubville; bronze tablet marked "507"	506.869
Section 1, T. 41 N., R. 1 W., 6 feet south of northwest corner of; rock west of road; copper bolt marked "699"	698.653
Section 36, T. 42 N., R. 1 W., near northwest corner of; cornerstone of curb on southeast corner of Frederick Augerer's store, 200 feet north of St. Clair depot; copper bolt marked "769"	768.872
Section 1, T. 41 N., R. 1 E., in NW. ¼ of; rock 15 feet east of spring at S. H. Dixon's place; copper bolt marked "515"	514.666
Section 8, T. 41 N., R. 2 E., NW. ¼ of; top of rock in front door of Lone Dell post-office	550
Section 21, T. 41 N., R. 2 E., southwest corner of NW. ¼ of; forks of road	777
Section 23, T. 41 N., R. 2 E., southwest corner of NW. ¼ of; nail in stump opposite church at forks of road	775

	Feet.
Section 32, T. 1 S., R. 18 W.; iron post marked "523"	523.083
Section 30, T. 2 S., R. 18 W., at Dipping Springs; iron post marked "532".	532.051
Section 17, T. 3 S., R. 18 W., at Potash Sulphur Springs; iron post marked "388"	387.681
Section 3, T. 4 S., R. 20 W.; iron post marked "510"	509.112

NEBRASKA.

CHEYENNE AND DEUEL COUNTIES.

SIDNEY AND BROWNS CREEK QUADRANGLES.

The elevations in the following list are based on a copper bolt set in the astronomic monument marked "U. S. G. S. 4086 Ft. B. M." in old Fort Sidney. The initial height on which the leveling in this locality rests is the elevation of the Union Pacific Railroad bridge over Lodgepole Creek near milepost 410, being the railroad company's elevation, 4,016.12 feet for reduction to the Omaha datum. From this the elevation of the central datum point as accepted is 4,086.279 feet. The leveling was by Mr. H. M. Trippe, under the general direction of Mr. H. B. Blair, topographer.

	Feet.
Section 7, T. 13 N., R. 49 W., southeast corner of, iron post marked "4284".	4,284.262
Section 18, T. 13 N., R. 49 W., ground surface at southeast corner of	4,266
Section 19, T. 13 N., R. 49 W., ground surface at southeast corner of	4,304
Section 30, T. 13 N., R. 49 W., ground surface at southeast corner of; iron post marked "4288"	4,288.272
Section 31, T. 13 N., R. 49 W., ground surface at southeast corner of	4,272
Section 32, T. 13 N., R. 49 W., ground surface at southeast corner of	4,295
Section 33, T. 13 N., R. 49 W., ground surface at southeast corner of	4,265
Section 34, T. 13 N., R. 49 W., ground surface at southeast corner of	4,270
Section 35, T. 13 N., R. 49 W., ground surface at southeast corner of	4,260
Section 36, T. 13 N., R. 49 W., ground surface at southeast corner of, iron post marked "4233"	4,233.829
Section 30, T. 13 N., R. 48 W., ground surface at southeast corner of	4,241
Section 19, T. 13 N., R. 48 W., ground surface at southeast corner of	4,220
Section 18, T. 13 N., R. 48 W., ground surface at southeast corner of	4,156
Section 7, T. 13 N., R. 48 W., ground surface at southeast corner of	4,190
Section 6, T. 13 N., R. 48 W., ground surface at southeast corner of	4,171
Union Pacific Railway depot, Sidney, door-sill of ladies' waiting room, T. 14 N., R. 49 W	4,093.540
Astronomical monument in parade ground in old Fort Sidney, T. 14 N., R. 49 W.; copper bolt marked "4086"	4,086.279
Union Pacific Railway bridge over Lodge Pole Creek, near 410 milepost on east end of stringer, T. 14 N., R. 49 W	4,028
125 feet west of above bridge, near southwest corner, sec. 25, T. 14 N., R. 49 W.; iron post marked "4025"	4,025.083
Section 31, T. 14 N., R. 48 W., ground surface at southeast corner of	4,048
Schoolhouse, sec. 29, T. 14 N., R. 48 W., northwest corner stone in foundation of; copper plug marked "4015"	4,015.395
Section 19, T. 14 N., R. 48 W., ground surface at southeast corner of	4,048
Section 18, T. 14 N., R. 48 W., ground surface at southeast corner of	4,136
Section 7, T. 14 N., R. 48 W., southeast corner of; iron post marked "4165"	4,165.415
Section 6, T. 14 N., R. 48 W., ground surface at southeast corner of	4,175

	Feet.
Section 28, T. 15 N., R. 49 W., ground surface at southeast corner of; iron post marked "4226"	4, 226. 447
Section 13, T. 15 N., R. 49 W., southeast corner of; iron post marked "4190"	4, 189. 761
Section 31, T. 15 N., R. 48 W., ground surface at southeast corner of	4, 180
Section 30, T. 15 N., R. 48 W., ground surface at southeast corner of	4, 149
Section 19, T. 15 N., R. 48 W., ground surface at southeast corner of	4, 157
Section 18, T. 15 N., R. 48 W., ground surface at southeast corner of	4, 178
Section 7, T. 15 N., R. 48 W., ground surface at southeast corner of	4, 128
Section 6, T. 15 N., R. 48 W., southeast corner of; iron post marked "4163".	4, 162. 851
Section 3, T. 15 N., R. 48 W., ground surface where road starts up hill in Rush Creek Valley	4, 061
Section 11, T. 16 N., R. 49 W., ground surface at southeast corner of	4, 204
Section 14, T. 16 N., R. 49 W., ground surface at southeast corner of	4, 192
Section 26, T. 16 N., R. 49 W., southeast corner of; iron post marked "4194".	4, 194. 088
Section 27, T. 16 N., R. 48 W., southeast corner of; top of fence post	4, 120
Section 26, T. 16 N., R. 48 W., schoolhouse in northwest corner of; bronze tablet marked "4122"	4, 121. 645
Section 15, T. 16 N., R. 48 W., southeast corner of; nail in side of post	4, 115. 8
Section 11, T. 16 N., R. 48 W., southeast corner of; iron post marked "4109".	4, 108. 898
Section 2, T. 16 N., R. 48 W., ground surface at southeast corner of	4, 085
Section 8, T. 16 N., R. 47 W., southeast corner of; iron post marked "4030".	4, 030. 328
Section 10, T. 16 N., R. 47 W., 100 feet north and 100 feet east of southwest corner of, ground surface at	4, 037
Section 11, T. 16 N., R. 47 W., 100 feet east of southwest corner of, ground surface at	4, 012
Section 12, T. 16 N., R. 47 W., southwest corner of; iron post marked "3993".	3, 992. 736
Section 32, T. 17 N., R. 49 W., southeast corner of; iron post marked "4281".	4, 280. 795
Section 34, T. 17 N., R. 49 W., southeast corner of SW. ¼ of, ground surface at	4, 236
Section 36, T. 17 N., R. 49 W., southeast corner of; iron post marked "4202".	4, 202. 643
Section 31, T. 17 N., R. 48 W., ground surface at southeast corner of	4, 193
Section 21, T. 17 N., R. 48 W., southeast corner of; iron post marked "4145".	4, 144. 664
Section 22, T. 17 N., R. 48 W., ground surface at southeast corner of	4, 127
Section 30, T. 17 N., R. 47 W., northwest corner of, in southeast corner of schoolhouse; bronze tablet marked "4101"	4, 101. 046
Section 31, T. 17 N., R. 47 W., southeast corner of; iron post marked "4041".	4, 040. 734
Section 30, T. 17 N., R. 47 W., ground surface at southeast corner of	4, 057
Section 19. T. 17 N., R. 47 W., ground surface at southeast corner of	4, 101
Section 18, T. 17 N., R. 47 W., ground surface at southeast corner of	4, 092
Section 34, T. 18 N., R. 49 W., North's ranch; iron post marked "3898"	3, 897. 670
Section 26, T. 18 N., R. 48 W., Radcliffe's ranch; iron post marked "3728".	3, 728. 256
Section 31, T. 18 N., R. 46 W., Hanna's ranch; iron post marked "3509"	3, 509. 253
Section 4, T. 17 N., R. 46 W., NW. ¼ of, north side of river road; iron post marked "3542"	3, 541. 944
Section 12, T. 17 N., R. 46 W., near center of, at crossroads; iron post marked "3477"	3, 476. 839
Section 30, T. 17 N., R. 45 W., at gate on road near northeast corner of section; iron post marked "3504"	3, 503. 667
Section 2, T. 16 N., R. 46 W., at forks of road near southeast corner of section; iron post marked "3608"	3, 608. 215
Section 27, T. 16 N., R. 46 W., at gate on road near east side of section; iron post marked "3689"	3, 688. 629
Section 3, T. 18 N., R. 49 W., southeast corner of SW. ¼ of; iron post marked "3699"	3, 698. 789

	Feet.
Section 15, T. 18 N., R. 49 W., southeast corner of; nail 10 inches from ground in fence-corner post	3,759.4
Section 11, T. 18 N., R. 48 W., on river road near northwest corner of; iron post marked "3564"	3,564.177
Section 19, T. 18 N., R. 47 W., east side of, southeast corner of Nichol's house; tablet marked "3613"	3,612.762
Section 5, T. 18 N., R. 47 W., Ramsburg's ranch in NE. ¼ of; iron post marked "3545"	3,544.951
Belmont, near northeast corner of sec. 18, T. 19 N., R. 49 W.; iron post marked "3638"	3,638.225
Section 14, T. 19 N., R. 49 W., southeast corner of NE. ¼ of (Bearline's ranch); iron post marked "3613"	3,613.211
Section 35, T. 19 N., R. 49 W., west side of; grade of Belmont Canal Flume over Deepholes Creek	3,651
Section 30, T. 19 N., R. 48 W., southeast corner of; iron post marked "3596".	3,596.147
Carl Wagner's ranch, south side of sec. 27, T. 19 N., R. 48 W.; iron post marked "3577"	3,577.259
Pat Rowlan's ranch, east side of sec. 35, T. 19 N., R. 48 W., top of northeast post of windmill, about 2 feet from ground	3,565.2
Forks of road, 3½ miles north of Remsburg's ranch, near southwest corner of sec. 16, T. 19 N., R. 47 W.; iron post marked "4044"	4,044.274
Section 25, T. 19 N., R. 47 W., southeast corner of NE. ¼ of; iron post marked "4025"	4,024.604
Section 32, T. 20 N., R. 49 W., southwest corner of; iron post marked "3689".	3,689.198
Section 36, T. 20 N., R. 49 W., southeast corner of; iron post marked "3727".	3,727.331
Delano's ranch, northwest quarter of sec. 19, T. 20 N., R. 48 W.; iron post marked "3902"	3,902.152
Section 7, T. 20 N., R. 47 W., SW. ¼ of, at crossroads; iron post marked "4239"	4,238.846
Section 32, T. 20 N., R. 47 W., on side of road, between Remsburg's and Hibler's ranches; iron post marked "4099"	4,099.361
Section 12, T. 21 N., R. 49 W., crossroads, near north side of; iron post marked "4135"	4,134.906
Section 26, T. 21 N., R. 49 W., forks of road, near north side of; iron post marked "4370"	4,370.150
Peer's ranch, sec. 9, T. 21 N., R. 48 W.; iron post marked "4041"	4,040.543
Haine's ranch, sec. 13, T. 21 N., R. 48 W.; iron post marked "4018"	4,017.769
J. W. Rodger's ranch, SW. ¼ of sec. 4 (on account of error in Land Office work it should be in SW. ¼ of sec. 3), T. 21 N., R. 47 W.; iron post marked "3946"	3,945.612
Hibler's ranch, southwest corner of sec. 28, T. 21 N., R. 47 W.; iron post marked "3989"	3,988.979
Margesson's ranch, sec. 8, T. 21 N., R. 46 W.; iron post marked "3897"	3,896.956
Section 2, T. 22 N., R. 49 W., by side of Alliance road, near north side of; iron post marked "4117"	4,116.682
Section 27, T. 22 N., R. 49 W., at forks of road, in SE. ¼ of; iron post marked "4125"	4,124.45
Section 1, T. 22 N., R. 48 W., on side of road, in NE. ¼ of; iron post marked "3977"	3,977.447
Section 27, T. 22 N., R. 48 W., at forks of road, in NE. ¼ of; iron post marked "4040"	4,039.822
Section 21, T. 22 N., R. 47 W., SE. ¼ of; southwest side of Alliance road; iron post marked "3955"	3,954.693
Section 1, T. 22 N., R. 47 W., northeast corner of; iron post, marked "3901".	3,900.592
Ralls ranch, sec. 14, T. 23 N., R. 49 W., near northwest corner of; iron post marked "4093"	4,092.374

	Feet.
Johnson's ranch, sec. 25, T. 23 N., R. 49 W., near center of; anchor of gate south of house	4,060.9
James's ranch, SE. ¼ of sec. 12, T. 23 N., R. 49 W.; top of southeast anchor post of windmill tower	4,043
Fleet's ranch, sec. 17, T. 23 N., R. 48 W.; iron post marked "4026"	4,026.143
Section 3, T. 23 N., R. 48 W., northeast corner of; iron post marked "3969".	3,969.078
Section 29, T. 23 N., R. 47 W., near southeast corner of; west anchor of gate 20 feet north of crossroads, ¾ of a mile west from Smith's ranch	3,966.9
Section 28, T. 23 N., R. 47 W., near east side of; south side of gate on road from Smith's ranch to Hague's ranch; iron post marked "3950"	3,949.923
Hague's ranch, near center of sec. 35, T. 23 N., R. 47 W.; top of knot on west gatepost just north of house	3,923
Section 29, T. 23 N., R. 46 W., at crossroads south of Wild Horse Lake; iron post marked "3901"	3,901.116
Section 24, T. 23 N., R. 46 W., near southwest corner of, on side of Alliance road; iron post marked "3890"	3,890.078
Hill's ranch, sec. 17, T. 23 N., R. 45 W., near east side of section; iron post marked "3886"	3,886.347
Section 4, T. 22 N., R. 46 W., at forks of road in SE. ¼ of; iron post marked "3895"	3,895.482
Section 13, T. 22 N., R. 46 W., at forks of road, near south line of; iron post marked "3878"	3,878.259
Section 32, T. 22 N., R. 45 W., ground surface at crossroads, near west side of	3,861
Hubble's ranch, near northwest corner of sec. 34, T. 22 N., R. 45 W.; iron post marked "3856"	3,855.703
Section 1, T. 21 N., 46 W., at crossroads near centre of southern half of; iron post marked "3865"	3,864.729
Section 21, T. 21 N., R., 45 W., one-quarter of a mile south of Avery's ranch at forks of road, ground surface near center of	3,835
Orlando Post-Office, in NW. ¼ of Sec. 29, T. 21 N., R. 45 W.; iron post marked "3854"	3,854.115
Slater's ranch, SE. ¼ of sec. 3, T. 20 N., R. 46 W.; iron post marked "3872".	3,872.398
Richardson's ranch, near center of sec. 22, T. 20 N., R. 46 W.; iron post marked "3866"	3,865.895
Section 17, T. 20 N., R. 45 W., at bend in road southeast of Twin Lakes, near center of northern half of; iron post marked "3815"	3,814.691
Section 11, T. 19 N., R. 46 W., at forks of road just south of Blowout, in sand hills in eastern half of; iron post marked "3881"	3,881.624
Section 23, T. 19 N., R. 46 W., on side of road near center of; iron post marked "3948"	3,948.043
Section 31, T. 19 N., R. 45 W., southeast corner of SW. ¼ of; iron post marked "3952"	3,952.091
Section 10, T. 18 N., R. 46 W., south edge of table, on side of road, in NW. ¼ of; iron post marked "3977"	3,977.165
Section 17, T. 18 N., R. 45 W., southeast corner of; iron post marked "3935".	3,935.007

SOUTH DAKOTA.

HUTCHINSON, YANKTON, BONHOMME, CLAY, AND TURNER COUNTIES.

OLIVET AND PARKER QUADRANGLES.

The elevations in the following list are based on a Mississippi River Commission bench mark, which is a stone in the bottom of a hollow iron post in the court-house square in Yankton, the elevation of which is 1,197.291 feet above mean sea level. This bench mark was accepted as the central datum point for work in this locality. The leveling was done by Mr. Alfred Tyler, levelman, under the general direction of Mr. W. H. Griffin, topographer.

	Feet.
Chicago and North-Western Railway; crossing of Great Northern, T. 97 N., R. 52 W., height of rail	1,291.28
Chicago and North-Western Railway; crossing of township line, between townships 96 and 97, R. 52 W., height of rail	1,254.04
Chicago and North-Western Railway; crossing of north and south section line, between secs. 15 and 16, T. 96 N., R. 52 W.; height of rail	1,244.77
Chicago and North-Western Railway; crossing of east and west section line between secs. 22 and 27, T. 96 N., R. 52 W.; height of rail	1,214.69
Chicago and North-Western Railway; crossing of east and west section line between secs. 28 and 33, T. 96 N., R. 52 W.; height of rail	1,219.71
Section 7, T. 100 N., R. 53 W., northwest corner of; iron post marked "1358"	1,358.463
Section 7, T. 100 N., R. 53 W., northeast corner of; ground at crossroads	1,387
Section 8, T. 100 N., R. 53 W., northeast corner of; ground at crossroads	1,426
Section 9, T. 100 N., R. 53 W., southeast corner of; ground at crossroads	1,419
Section 16, T. 100 N., R. 53 W., southeast corner of; iron post marked "1402"	1,402.811
Section 21, T. 100 N., R. 53 W., southeast corner of; stone in center of crossroads	1,378.3
Section 28, T. 100 N., R. 53 W., southeast corner of; stone 200 feet west of crossroads	1,365.5
Section 33, T. 100 N., R. 53 W., southeast corner of; stone near root of tree at southwest corner crossroads	1,343
Section 8, T. 99 N., R. 53 W., northeast corner of; nail in root of tree at southeast corner of crossroads	1,351
Chicago, Milwaukee and St. Paul Railway, crossing of range line between ranges 53 W. and 54 W., T. 99 N.; height of rail	1,344.65
Chicago, Milwaukee and St. Paul Railway, in front of depot at Parker; height of rail	1,348.85
Parker, in foundation of court-house at; bronze tablet marked "1371"	1,371.708
Chicago and North-Western Railway, crossing of east and west section line, between secs. 21 and 28, T. 99 N., R. 53 W.; height of rail	1,326.58
Chicago and North-Western Railway, crossing of township line, between townships 99 N. and 98 N., R. 53 W.; height of rail	1,299.66
Section 4, T. 98 N., R. 53 W., northeast corner of; iron post marked "1300"	1,299.78
Chicago and North-Western Railway, crossing of east and west section line, between secs. 10 and 15, T. 98 N., R. 53 W.; height of rail	1,276.19
Chicago and North-Western Railway, in front of depot at Hurley; height of rail	1,266.32
Hurley, in center of park at; iron post marked "1293"	1,292.964
Chicago and North-Western Railway, crossing of township line between townships 98 and 97 N., R. 53 W.; height of rail	1,284.75
Section 4, T. 97 N., R. 53 W., northeast corner of; stone in center of crossroads	1,302.1
Section 9, T. 97 N., R. 53 W., SE. ¼ of; nail in south end of highway bridge across Turkeyridge Creek	1,263.8
Section 20, T. 97 N., R. 53 W., northeast corner of; iron post marked "1281"	1,281.309
Section 19, T. 97 N., R. 53 W., northwest corner of; rock in southeast corner of crossroads	1,313.7
Section 31, T. 97 N., R. 53 W., southwest corner of; iron post marked "1382"	1,383.206

Section 7, T. 96 N., R. 53 W., northwest corner of; stone in southwest corner of crossroads	1,436.8
Section 18, T. 96 N., R. 53 W., northwest corner of; stone in northwest corner of crossroads	1,389.4
Section 30, T. 96 N., R. 53 W., northwest corner of; stone in northwest corner of crossroads	1,387.5
Great Northern Railroad; crossing of range line between ranges 53 and 54 W., T. 96 N.; height of rail	1,362.12
Section 12, T. 100 N., R. 54 W., northwest corner of; large rock at crossroads	1,394.6
Section 11, T. 100 N., R. 54 W., northwest corner of; stone at crossroads	1,506.7
Section 10, T. 100 N., R. 54 W., northwest corner of; large rock in northeast corner of crossroads	1,508.6
Chicago and North-Western Railway; crossing of north and south section line, between secs. 9 and 10, T. 100 N., R. 54 W.; height of rail	1,512.99
Section 16, T. 100 N., R. 54 W., northeast corner of; large rock in southeast corner of crossroads	1,502.7
Section 21, T. 100 N., R. 54 W., northeast corner of; iron post marked "1490"	1,490.141
Section 28, T. 100 N., R. 54 W., northeast corner of; nail in fence-post stake northwest corner crossroads	1,480
Section 33, T. 100 N., R. 54 W., northeast corner of; nail in fence post northeast corner crossroads	1,460.11
Section 4, T. 99 N., R. 54 W., northeast corner of; bridge across west fork Vermilion River at, south end of beam at west end of	1,358.37
Section 16, T. 99 N., R. 54 W., northeast corner of; large rock in northwest corner of crossroads	1,473.7
Section 21, T. 99 N., R. 54 W., northeast corner of; iron post marked "1454"	1,454.92
Section 28, T. 99 N., R. 54 W., northeast corner of; rock in northeast corner crossroads	1,469.1
Chicago, Milwaukee and St. Paul Railway, crossing of range line, between ranges 53 and 54 W., T. 99 N.; height of rail	1,344.64
Chicago, Milwaukee and St. Paul Railway, crossing of north and south section line, between secs. 9 and 10, T. 99 N., R. 54 W.; height of rail	1,453.19
Chicago, Milwaukee and St. Paul Railway, switch at south side of depot at Marion; height of rail	1,448.64
Chicago, Milwaukee and St. Paul Railway, crossing of range line between ranges 54 and 55 W., T. 99 N.; height of rail	1,452.88
Section 4, T. 98 N., R. 54 W., northeast corner of; iron post marked "1412"	1,413.15
Section 9, T. 98 N., R. 54 W., northeast corner of; large rock in southeast corner of crossroads	1,418.38
Section 16, T. 98 N., R. 54 W., northeast corner of; large rock in center of crossroads	1,377.9
Section 21, T. 98 N., R. 54 W., northeast corner of; iron post marked "1346"	1,347.053
Section 28, T. 98 N., R. 54 W., northeast corner of; large rock in southeast corner crossroads	1,365.12
Section 33, T. 98 N., R. 54 NW., northeast corner of; stone in center of crossroads	1,347.1
Section 4, T. 97 N., R. 54 W., northeast corner of; iron post marked "1302"	1,302.547
Section 9, T. 97 N., R. 54 W., northeast corner of; spike in post southeast corner crossroads	1,312.6
Section 16, T. 97 N., R. 54 W., northeast corner of; ground at crossroads	1,365
Section 19, T. 97 N., R. 54 W., northeast corner of; stone in center of crossroads	1,554.5
Section 21, T. 97 N., R. 54 W., northeast corner of; iron post marked "1360"	1,360.477
Section 22, T. 97 N., R. 54 W., northeast corner of; ground at crossroads	1,371

	Feet.
Section 23, T. 97 N., R. 54 W., northeast corner of; rock in center of crossroads	1,332.2
Section 25, T. 97 N., R. 54 W., northeast corner of; rock near second fence post, southeast corner crossroads	1,331.4
Section 36, T. 97 N., R. 54 W., northeast corner of; rock in southwest corner of crossroads	1,323.3
Chicago, Milwaukee and St. Paul Railway; crossing of range line, between ranges 54 and 55 W., T. 100 N.; height of rail	1,444.15
Bridge; across west fork of Vermilion River, on range line between ranges 54 and 55 W., T. 100 N., stone at south end of	1,374.07
Section 25, T. 100 N., R. 55 W., northeast corner of; stone at northeast corner of crossroads	1,402.2
Section 24, T. 100 N., R. 55 W., northeast corner of; nail in stake at fence corner, southwest corner of crossroads	1,445.4
Section 13, T. 100 N., R. 55 W., northeast corner of; stone near fence corner at southeast corner of crossroads	1,453.4
Section 12, T. 100 N., R. 55 W., northeast corner of; large rock in southeast corner of crossroads	1,478.5
Section 10, T. 100 N., R. 55 W., northeast corner of; stone at southeast corner of crossroads	1,424.8
Section 9, T. 100 N., R. 55 W., northeast corner of; iron post marked "1397"	1,397.595
Section 16, T. 100 N., R. 55 W., northeast corner of; stone at southwest corner of crossroads	1,407
Section 21, T. 100 N., R. 55 W., northeast corner of; fence stake in northwest corner of crossroads	1,416
Chicago, Milwaukee and St. Paul Railway, crossing of north and south section line, between secs. 21 and 22, T. 100 N., R. 55 W.; height of rail	1,433.85
Section 28, T. 100 N., R. 55 W., northeast corner of; ground at crossroads	1,442.9
Section 33, T. 100 N., R. 55 W., northeast corner of; stone center of crossroads	1,439.5
Section 4, T. 99 N., R. 55 W., northeast corner of; iron post marked "1444"	1,444.681
Section 9, T. 99 N., R. 55 W., northeast corner of; nail in fence post northeast corner of crossroads	1,447.7
Section 16, T. 99 N., R. 55 W., northeast corner of; stone in southeast corner of crossroads	1,457.2
Section 21, T. 99 N., R. 55 W., northeast corner of; iron post marked "1474"	1,473.912
Section 28, T. 99 N., R. 55 W., northeast corner of; stone in southeast corner of crossroads, near fence	1,481.1
Section 33, T. 99 N., R. 55 W., northeast corner of; large rock in southwest corner crossroads, side of fence	1,501.6
Chicago, Milwaukee and St. Paul Railway, crossing of section line between secs. 15 and 16, T. 99 N., R. 55 W.; height of rail	1,467.85
Chicago, Milwaukee and St. Paul Railroad, crossing of section line between secs. 19 and 20, T. 99 N., R. 55 W.; height of rail	1,480.63
Section 4, T. 98 N., R. 55 W., northeast corner of; iron post, marked "1525"	1,525.155
Section 9, T. 98 N., R. 55 W., northeast corner of; ground at crossroads	1,542
Section 16, T. 98 N., R. 55 W., northeast corner of; large stone in southwest corner of crossroads	1,515.1
Section 21, T. 98 N., R. 55 W., northeast corner of; iron post marked "1434"	1,434.083
Section 28, T. 98 N., R. 55 W., northeast corner of; stone in center of crossroads	1,394.1

	Feet.
Section 4, T. 97 N., R. 55 W., northeast corner of; iron post marked "1615"	1,614.954
Section 9, T. 97 N., R. 55 W., northeast corner of; stone in northeast corner of crossroads	1,676.4
Section 16, T. 97 N., R. 55 W., northeast corner of; stake in southeast corner of crossroads	1,677.2
Section 21, T. 97 N., R. 55 W., northeast corner of; iron post marked "1683"	1,683.120
Section 22, T. 97 N., R. 55 W., northeast corner of; stone at crossroads	1,683
Section 23, T. 97 N., R. 55 W., northeast corner of; stone in northeast corner of crossroads	1,631
Section 28, T. 97 N., R. 55 W., northeast corner of; rock in southeast corner of crossroads	1,639
Section 33, T. 97 N., R. 55 W., northeast corner of; guy post at fence corner, northeast corner crossroads	1,605.8
Section 33, T. 97 N., R. 55 W., southeast corner of; ground at crossroads	1,589
Section 32, T. 97 N., R. 55 W., southeast corner of; rock in southeast corner of crossroads	1,517.8
Section 31, T. 97 N., R. 55 W., southeast corner of; guy post at fence corner, northeast corner crossroads	1,453.6
Chicago and North-Western Railway, crossing of east and west section line, between secs. 28 and 33, T. 96 N., R. 52 W.; height of rail	1,219.71
Chicago and North-Western Railway, crossing of range line between ranges 52 W. and 53 W., T. 95 N.; height of rail	1,264.91
Chicago and North-Western Railway, crossing of east and west section line between secs. 14 and 23, T. 95, R. 53; height of rail	1,286.61
Chicago and North-Western Railway, in front of depot at Wakonda; height of rail	1,392.74
Irene, near township corners at; iron post marked "1371"	1,371.899
Section 5, T. 95 N., R. 53 W., northeast corner of; rock in center of crossroads	1,390.7
Section 4, T. 95 N., R. 53 W., northeast corner of; iron post marked "1323"	1,323.603
Section 16, T. 95 N., R. 53 W., northeast corner of; ground at crossroads	1,370
Section 21, T. 95 N., R. 53 W., northeast corner of; ground at crossroads	1,411
Wakonda, in front of town hall at; iron post marked "1390"	1,390.549
Section 18, T. 100 N., R. 56 W., northwest corner of; ground at crossroads	1,413
Section 19, T. 100 N., R. 56 W., northeast corner of; stone near fence post northwest corner crossroads	1,426.7
Section 20, T. 100 N., R. 56 W., northeast corner of; stone in northwest corner of crossroads	1,420.5
Section 28, T. 100 N., R. 56 W., northeast corner of; rock in center of crossroads	1,438.2
Section 33, T. 100 N., R. 56 W., northeast corner of; rock in southeast corner of crossroads	1,442.3
Section 4, T. 99 N., R. 56 W., northeast corner of; iron post marked "1445"	1,445.802
Section 9, T. 99 N., R. 56 W., northeast corner of; rock in southeast corner of crossroads	1,455.1
Section 16, T. 99 N., R. 56 W., northeast corner of; stone in southwest corner of crossroads	1,457.6
Section 21, T. 99 N., R. 56 W., northeast corner of; stone in northwest corner of crossroads	1,460.4
Section 33, T. 99 N., R. 56 W., northeast corner of; stone in center of crossroads	1,487.5
Chicago, Milwaukee and St. Paul Railway, in front of depot at Freeman; height of rail	1,510.72

	Feet.
Freeman, southeast corner of Windmill square, iron post at; marked "1514"	1,514.086
Chicago, Milwaukee and St. Paul Railway, crossing of section line between secs. 33 and 34, T. 99 N., R. 56 W.; height of rail	1,512.86
Section 9, T. 98 N., R. 56 W., northeast corner of; ground at crossroads	1,552
Section 16, T. 98 N., R. 56 W., northeast corner of; nail in fence post northwest corner of crossroads	1,581.3
Section 21, T. 98 N., R. 56 W., northeast corner of; iron post marked "1599"	1,599.342
Section 20, T. 98 N., R. 56 W., northeast corner of; rock in center of crossroads	1,502.1
Section 19, T. 98 N., R. 56 W., northeast corner of; ground at crossroads	1,441
Chicago, Milwaukee and St. Paul Railway, crossing of range line between ranges 56 and 57 W., T. 98 N.; height of rail	1,405.4
Section 36, T. 97 N., R. 56 W., southeast corner of; iron post marked "1456"	1,456.07
Section 35, T. 97 N., R. 56 W., southeast corner of; stone in northwest corner of crossroads	1,426.2
Section 34, T. 97 N., R. 56 W., southeast corner of; large stone in center of crossroads	1,394.2
Section 33, T. 97 N., R. 56 W., southeast corner of; rock in center of crossroads	1,347.9
Section 32, T. 97 N., R. 56 W., southeast corner of; stone in southwest corner of crossroads	1,324.1
Section 31, T. 97 N., R. 56 W., southeast corner of; stone in center of crossroads	1,309.8
Section 12, T. 100 N., R. 57 W., northeast corner of; iron post marked "1410"	1,410.612
Section 11, T 100 N., R. 57 W., northeast corner of; stone at crossroads	1,395.9
Section 9, T. 100 N., R. 57 W., northeast corner of; large rock at crossroads	1,392.5
Section 8, T. 100 N., R. 57 W., northeast corner of; ground at crossroads	1,383
Section 7, T. 100 N., R. 57 W., northeast corner of; rock northwest corner of crossroads	1,367.5
Section 7, T. 99 N., R. 57 W., northwest corner of; nail in fence post southeast corner of crossroads	1,314.1
Section 18, T. 99 N., R. 57 W., northwest corner of; rock in southwest corner of crossroads	1,324.7
Section 19, T. 99 N., R. 57 W., northwest corner of; iron post marked "1328"	1,327.691
Section 21, T. 99 N., R. 57 W., northeast corner of; iron post marked "1366"	1,366.55
Section 28, T. 99 N., R. 57 W., northeast corner of; nail in tree southeast corner crossroads	1.362
Section 4, T. 98 N., R. 57 W., northeast corner of; iron post marked "1355"	1,355.511
Section 9, T. 98 N., R. 57 W., northeast corner of; stake near fence post southeast corner of crossroads	1,346
Section 16, T. 98 N., R. 57 W., southeast corner of; iron post marked "1351"	1,351.223
Section 28, T. 98 N., R. 57 W., northeast corner of; rock in southwest corner of crossroads	1,340.1
Section 24, T. 98 N., R. 57 W., northeast corner of; iron post marked "1403"	1,403.595
Menno, crossroads near mill at; iron post marked "1327"	1,327.385
Chicago, Milwaukee and St. Paul Railway, crossroads at Menno on; height of rail	1,329.60

	Feet.
Chicago, Milwaukee and St. Paul Railway, in front of depot at Menno; height of rail	1,325.04
Chicago, Milwaukee and St. Paul Railway, bridge No. 1668; height of rail.	1,230.54
Section 28, T. 97 N., R. 57 W., northeast corner of; rock in southwest corner of crossroads	1,308.7
Section 33, T. 97 N., R. 57 W., northeast corner of; rock in northwest corner of crossroads	1,302.8
Section 34, T. 97 N., R. 57 W., southwest corner of; iron post marked "1290"	1,290.695
Section 35, T. 97 N., R. 57 W., southeast corner of; guy post at fence corner at crossroads	1,292.6
Section 36, T. 97 N., R. 57 W., southeast corner of; iron post marked "1307"	1,307.585
Section 12, T. 100 N., R. 58 W., northeast corner of; iron post marked "1349"	1,349.276
Section 11, T. 100 N., R. 58 W., northeast corner of; ground at crossroads.	1,334
Section 10, T. 100 N., R. 58 W., northeast corner of; rock in southeast corner of crossroads	1,335.7
Section 9, T. 100 N., R. 58 W., northeast corner of; rock in center of crossroads	1,323.4
Section 7, T. 100 N., R. 58 W., northeast corner of; nail in fence post southeast corner of crossroads	1,316.6
Section 5, T. 99 N., R. 58 W., northeast corner of; nail in tree southeast corner of crossroads	1,318.32
Section 4, T. 99 N., R. 58 W., northeast corner of; iron post marked "1330".	1,330.376
Section 3, T. 99 N., R. 58 W., northeast corner of; ground at crossroads ..	1,331
Section 2, T. 99 N., R. 58 W., northeast corner of; rock in center of crossroads	1,323.3
Section 12, T. 99 N., R. 58 W., northeast corner of; nail in fence post southeast corner of crossroads	1,314.2
Section 13, T. 99 N., R. 58 W., northeast corner of; rock in southwest corner of crossroads	1,324.7
Section 7, T. 97 N., R. 58 W., northeast corner of; rock in northwest corner of crossroads	1,306.1
Section 8, T. 97 N., R. 58 W., northeast corner of; nail in highway bridge across N. and S. road	1,289.55
Section 9, T. 97 N., R. 58 W., northeast corner of; nail in tree stump at crossroads	1,280.75
Olivet, foundation of court-house, southwest corner of; bronze tablet marked "1221"	1,221.306
Section 14, T. 97 N., R. 58 W., SE. ¼ of; nail in east end of highway bridge, ¼ mile north of Mr. Bray's house	1,193.8
Chicago, Milwaukee and St. Paul Railway, crossing of section line between secs. 33 and 34, T. 97 N., R. 58 W.; height of rail	1,301.65
Chicago, Milwaukee and St. Paul Railway bridge across James River, in T. 97 N., R. 58 W.; height of rail	1,189.86
Section 12, T. 100 N., R. 59 W., northeast corner of; iron post marked "1315"	1,315.369
Section 24, T. 100 N., R. 59 W., northeast corner of; stake near fence post at southeast corner of crossroads	1,310.3
Section 25, T. 100 N., R. 59 W., northeast corner of; nail in tree at northwest corner of crossroads	1,312.4
Section 36, T. 100 N., R. 59 W., northeast corner of; nail in fence post at northeast corner of crossroads	1,301.8

	Feet.
Section 1, T. 99 N., R. 59 W., northeast corner of; rock about 100 feet west of crossroads	1,312.24
Milltown, at east end of James River Bridge; iron post marked "1200"	1,199.656
James River, at Milltown; water level at bridge	1,188.520
Section 12, T. 97 N., R. 59 W., northeast corner of; rock in southwest corner of crossroads	1,315.86
Section 13, T. 97 N., R. 59 W., northeast corner of; rock in southwest corner of crossroads	1,331.1
Section 24, T. 97 N., R. 59 W., northeast corner of; bolthead in southeast corner highway bridge	1,309
Section 25, T. 97 N., R. 59 W., northeast corner of; nail in northeast corner of highway bridge at crossroads	1,325.8
Section 36, T. 97 N., R. 59 W., northeast corner of; nail in stake at crossroads	1,347.2
Section 23, T. 97 N., R. 59 W., northeast corner of; nail in guy post at fence corner southeast corner crossroads	1,339.8
Section 22, T. 97 N., R. 59 W., northeast corner of; rock near fence at southwest corner of crossroads	1,353.2
Section 21, T. 97 N., R. 59 W., northeast corner of; stake in southwest corner of crossroads	1,366.6
Section 28, T. 97 N., R. 59 W., northeast corner of; stake in northwest corner of crossroads	1,368.1
Chicago, Milwaukee and St. Paul Railway, crossing of section line between secs. 33 and 34, T. 97 N., R. 59 W.; height of rail	1,388.02
Chicago, Milwaukee and St. Paul Railway, crossing of section line between secs. 34 and 35, T. 97 N., R. 59 W.; height of rail	1,378.37
Chicago, Milwaukee and St. Paul Railway; railroad scales at Scotland, north end of depot platform, nail at southeast corner of	1,345.91
Chicago, Milwaukee and St. Paul Railway, Tyndall and Yankton Junction, 1 mile south of Scotland; top of bolt in southwest corner of switch stand	1,361.93
Chicago, Milwaukee and St. Paul Railway, crossing of section line between secs. 21 and 28, T. 96 N., R. 58 W.; height of rail	1,357.77
Chicago, Milwaukee and St. Paul Railway, crossing of township line between Ts. 96 and 95 N., R. 58 W.; height of rail	1,348.92
Chicago, Milwaukee and St. Paul Railway, crossing of range line between Rs. 57 and 58 W., T. 95 N.; height of rail	1,377.21
Chicago, Milwaukee and St. Paul Railway, crossing of range line between Rs. 58 and 59 W., T. 96 N.; height of rail	1,362.85
Section 1, T. 96 N., R. 59 W., northeast corner of; nail in root of poplar tree northwest corner of crossroads	1,354.7
Chicago, Milwaukee and St. Paul Railway, Lesterville, in front of depot; height of rail	1,381.04
Chicago, Milwaukee and St. Paul Railway, crossing of section line between secs. 22 and 27, T. 95 N., R. 57 W.; height of rail	1,315.32
Chicago, Milwaukee and St. Paul Railway, crossing of township line between Ts. 94 and 95, R. 56 W.; height of rail	1,348.62

WYOMING.

LARAMIE COUNTY.

GOSHEN HOLE QUADRANGLE.

The elevations in the following list are based on a bronze tablet in the State Capitol building at Cheyenne, marked "6101." The initial height on which the leveling in this locality rests is the elevation of top of rail of the Union Pacific Railroad in front of station at Cheyenne, as reduced to Omaha datum. From this the elevation of the central datum point is accepted at 6,101.218 feet above mean sea level. The leveling was by Mr. M. C. McFarland, under the general direction of Mr. John H. Renshawe, topographer in charge of central section of topography.

	Feet.
Capitol building, Cheyenne, top step, south front of; bronze tablet marked "6101"	6, 101. 218
Section 8, T. 14 N., R. 66 W., ¼ corner south side of; iron post marked "6134"	6, 133. 962
Section 29, T. 15 N., R. 66 W., northeast corner of; iron post marked "6092"	6, 091. 545
Pole Creek, north side, at road crossing; iron post marked "6017"	6, 017. 13
Section 29, T. 16 N., R. 65 W., northeast corner of; iron post marked "6031"	6, 031. 209
Section 3, T. 16 N., R. 64 W., southwest corner of; iron post marked "5728"	5, 728. 5
Section 22, T. 17 N., R. 63 W., ¼ corner, south side of; iron post marked "5638"	5, 637. 793
Section 17, T. 18 N., R. 62 W., 1,052 feet east from southwest corner of; iron post marked "4983"	4, 982. 74
Section 1, T. 18 N., R. 62 W., northeast corner of; iron post marked "4984"	4, 983. 527
Section 24, T. 19 N., R. 62 W., northeast corner of; iron post marked "4904"	4, 903. 982
Section 6, T. 19 N., R. 61 W., 330 feet east of northwest corner of; iron post marked "4658"	4, 658. 461
Section 24, T. 20 N., R. 62 W., northeast corner of; iron post marked "4510"	4, 510. 133
Section 6, T. 20 N., R. 61 W., northwest corner of; iron post marked "4513"	4, 512. 968
Section 19, T. 21 N., R. 61 W., northwest corner of; iron post marked "4359"	4, 359. 106
Section 6, T. 21 N., R. 61 W., northwest corner of; iron post marked "4340"	4, 339. 534
Section 19, T. 22 N., R. 61 W., northwest corner of; iron post marked "4263"	4, 262. 747
Section 6, T. 22 N., R. 61 W., northwest corner of; iron post marked "4235"	4, 234. 554
Section 19, T. 23 N., R. 61 W., northwest corner of; iron post marked "4258"	4, 258. 185
Section 6, T. 23 N., R. 61 W., iron post marked "4314"	4, 314. 378
Section 19, T. 24 N., R. 61 W., iron post marked "4220"	4, 219. 612
Section 7, T. 24 N., R. 61 W., ¼ corner, west side of; iron post marked "4110"	4, 109. 717
Section 1, T. 23 N., R. 61 W., northeast corner of; iron post marked "4183"	4, 182. 542
Section 10, T. 23 N., R. 60 W., southeast corner of; iron post marked "4038"	4, 038. 467
Section 34, T. 23 N., R. 60 W., southeast corner of; iron post marked "4064"	4, 064. 454
Section 31, T. 23 N., R. 60 W., southwest corner of; iron post marked "4244"	4, 244. 241
Section 34, T. 23 N., R. 61 W., southwest corner of; iron post marked "4242"	4, 241. 883

ROCKY MOUNTAIN SECTION OF TOPOGRAPHY.

In this section, under the general direction of Mr. E. M. Douglas, topographer in charge, six leveling parties were engaged during the entire season in running lines of spirit levels for the control of the topographic work in the various localities.

COLORADO.

ARKANSAS DRAINAGE BASIN.

PUEBLO, NEPESTA, AND APISHAPA QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the county court-house at Pueblo and marked "4690." The initial elevation on which the work in this locality rests is the Denver and Rio Grande Railroad Company's bench mark on the south end of the doorsill of the ladies' waiting room of the Union Depot, determined as 4,654.44 feet above mean sea level, being the railroad company's elevation less 17 feet correction for error of Denver datum. Based on this elevation, the central datum point has been accepted as 4,690 feet. The leveling was done by Mr. J. C. Barber, under the general direction of Mr. E. M. Douglas, in charge of section.

PUEBLO TO BOONE, VIA ATCHISON, TOPEKA AND SANTA FE RAILWAY.

	Feet.
Pueblo court-house, 12 feet west of northeast corner; bronze tablet marked "4690"	4,690
Pueblo Grand Opera House, 20 feet west of northeast corner; bronze tablet marked "4665"	4,664.607
Pueblo City Hall, north side of main entrance; cross on lintel	4,656.59
Pueblo, Atchison, Topeka and Santa Fe Railway bridge over Fountain Creek; copper nail in center top of south guard rail	4,653.8
Pueblo, 1 mile east of; spike in telegraph pole at Atchison, Topeka and Santa Fe Railway milepost No. 617	4,640.99
Pueblo, 2 miles east of; Atchison, Topeka and Santa Fe Railway milepost No. 616; spike in telegraph pole	4,629.33
Pueblo, 3 miles east of, at Atchison, Topeka and Santa Fe Railway milepost No. 615; spike in telegraph pole	4,628.46
Pueblo, 4 miles east of, at Atchison, Topeka and Santa Fe Railway milepost No. 614; spike in telegraph pole	4,631.57
Pueblo, 5 miles east of, at Atchison, Topeka and Santa Fe Railway milepost No. 613; spike in telegraph pole	4,628.19
Pueblo, 5¼ miles east of, and 720 feet west of Baxter; between the Atchison, Topeka and Santa Fe Railway and the Missouri Pacific Railway; iron post marked "4624"	4,623.927
Pueblo, 6 miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 612	4,614.82
Pueblo, 7 miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 611	4,592.67
Pueblo, 8 miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 610	4,583.40
Pueblo, 9 miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 609	4,555.63

	Feet.
Pueblo, 10 miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 608	4,556.29
Pueblo, 11 miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 607	4,549.82
Chico railroad station, ¼ mile west of; spike in Atchison, Topeka and Santa Fe Railway mile-post No. 606	4,544.14
Chico railroad station, 1,000 feet east of; between Atchison, Topeka and Santa Fe Railway and Missouri Pacific Railway; iron post, marked "4540"	4,540.427
Chico railroad station, ¾ mile east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 605	4,534.71
Chico railroad station, 1¾ miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 604	4,518.42
Chico railroad station, 2¾ miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 603	4,497.62
Chico railroad station, 3¾ miles east of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 602	4,477.81
Boone, 2¼ miles west of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 601	4,479.26
Boone, 1¼ miles west of; spike in Atchison, Topeka and Santa Fe Railway milepost No. 600	4,472.94
Boone, 2,500 feet west of the Missouri Pacific Railway station, 300 feet east of Atchison, Topeka and Santa Fe Railway milepost No. 599, and 52 feet north of Atchison, Topeka and Santa Fe Railway tracks; iron post marked "4477"	4,476.883
Boone, 1 mile southwest of; small cross on top of east rivet in cap of east pier of north abutment of iron highway bridge across Arkansas River	4,443.37

BOONE TO HUERFANO BRIDGE VIA RATTLESNAKE BUTTES, EAST TO APISHAPA RIVER AND FOWLER.

Boone, 2½ miles southwest of; copper nail in root of cottonwood tree midway between road on west side of Huerfano River and edge of bluff bordering marsh, 200 feet south of bend in road, 500 feet south of a row of six trees in pasture	4,471.16
Boone, 3 miles southwest of; wire nail in root of double cottonwood tree alone in pasture ½ mile northwest of river, ¼ mile east and slightly north of log hut at foot of mesa, ¾ mile northeast of residence, 900 feet north of graveyard on roadside	4,491.30
Boone, 4½ miles southwest of; spike in cottonwood tree at north end of row of four on side of abandoned irrigation ditch, ¾ mile southwest of adobe residence and brick building	4,512.63
Boone, 5 miles southwest of, 17 feet south of east ¼ corner of sec. 27, T. 21 S., R. 62 W.; iron post marked "4532"	4,531.785
Boone, 6 miles southwest of; spike in root of the tallest of a bunch of four cottonwood trees, 700 feet east of residence at foot of hill, 100 feet west of river bank	4,548.28
Boone, 7½ miles southwest of; copper nail in top of stake 18 feet from southwest corner of abandoned frame schoolhouse on top of bluff, 150 feet west of Huerfano River, near head of irrigation ditch	4,617.54
Sec. 9, T. 22 S., R. 62 W., 30 feet north of west quarter corner; spike in fence post southeast corner of inclosure	4,648.27
Sec. 8, T. 22 S., R. 62 W., near south quarter corner; spike in gatepost at corner of fence	4,652.82
Boone, 10 miles southwest of; iron post 30 feet east of west quarter corner of sec. 19, T. 22 S., R. 62 W., marked "4699"	4,699.038

	Feet.
Sec. 25, T. 22 S., R. 63 W., near west quarter corner; spike in southwestern of group of three corner fence posts	4, 743. 35
Huerfano bridge, 2¼ miles north of; spike in post of east and west fence, 500 feet west of corner, 350 feet west of intersection of fence and irrigation ditch, 2,000 feet east of dwelling near same fence	4, 796. 08
Huerfano bridge, sec. 8, T. 23 S., R. 63 W., capstone south pier, west end of; copper plug marked "U.S.G.S. 4774 Ft. B.M."	4. 774. 327

HUERFANO BRIDGE TO RATTLESNAKE BUTTES.

Huerfano bridge, 3,600 feet southeast of; 100 feet west of road; spike in corner of fence post	4, 819. 29
Huerfano bridge, 3 miles southeast of; 30 feet west of road; spike in corner fence post, east quarter corner of sec. 25, T. 23 S., R. 63 W	4, 913. 36
Huerfano bridge, 4 miles southeast of; ¾ mile northwest of Mexican's residence, 20 feet north of gate in east and west fence, in sec. 31, T. 23 S., R. 63 W.; iron post, marked "4958"	4, 957. 95
Mexican's house; spike in post 25 feet north of southwest corner of corral.	4, 979. 47
Mexican's house, 3,500 feet south of; spike in gatepost on south side of road	4, 989. 24
NW. ¼ sec. 19, T. 24 S., R. 62 W.; iron post, 35 feet west of road, 4 feet east of wire fence, 150 feet north of gate marked "5074"	5, 073. 955
Hog Ranch Canyon, ¾ miles south of mouth of, 100 feet east of road, 75 feet west of Doyle's Arroyo, 60 feet south of north end of stone ledge; chiseled cross on rock	5, 149. 22
SW. ¼ sec. 25, T. 24 S., R. 63 W., 200 feet southwest of road, 1,000 feet north of mouth of Hog Ranch Canyon; iron post marked "5194"	5, 193. 955
Hog Ranch Canyon, 1 mile southwest of road crossing 150 feet northeast of road crossing over small ravine 20 feet southwest of pinyon tree; cross on light rock	5, 266. 62
Hog Ranch Canyon, 1¾ miles southwest of crossing, 800 feet east of road; chiseled cross mark on rock, 8 inches above ground, south side of depression	5, 323. 88
SE. ¼ sec. 10, T. 25, R. 63 W., 3 miles north of south edge of Butler's pasture, 40 feet east of road, ¼ mile west of canyon; iron post marked "5514"	5, 513. 937
Butler's pasture, 2¾ miles north of south edge, 150 feet west of road, eastern of four flat rocks; chiseled cross mark on top of, 1 foot from ground.	5, 569. 96
Beardly Spring Canyon, south edge of, 60 feet northeast of road; chiseled cross on top of highest flat rock of ledge	5, 600. 57
Butler's pasture, ½ mile north of south side, 15 feet west of road crossing long ledge on south side of clearing; chiseled cross 1 foot south of large pine tree	5, 675. 06
NW. ¼ sec. 34, T. 25, R. 63 W.; 300 feet southwest of gate in south fence of Butler's pasture, 150 feet west of road to Cucharas Junction, 15 feet northeast of tree; copper bolt in top of flat rock, marked "U.S.G.S. 5742 Ft. B.M."	5, 742. 384
NE. ½ sec. 10, T. 26, R. 63 W.; 2½ miles southeast of gate in south fence of Butler's pasture, 30 feet east of road; iron post marked "5927"	5, 926. 932
Rattlesnake Buttes crossroads, ½ mile north of; 125 feet east of road, 350 feet southwest of Badger hills; wire nail in cedar stump	6, 116. 73

RATTLESNAKE BUTTES TO APISHAPA FORD.

S.W. ¼ sec. 22, T. 26 S., R. 63 W., ¾ mile east of Rattlesnake Buttes, 50 feet northeast of crossroads; iron post marked "6184"	6, 183. 91
Rattlesnake Buttes crossroads, 2 miles east of; 400 feet north of road; chiseled cross on stone 8 inches high, 4 feet west of the highest of a group of six	6, 091. 26

	Feet.
N.W. ¼ sec. 19, T. 26 S., R. 62 W., 3 miles east of Rattlesnake Buttes crossroads, 50 feet north of road; iron post marked "6009"	6, 009. 003
Rattlesnake Buttes crossroads, 4½ miles east of; 150 feet north of road; wire nail in corner fence post	5, 826. 78
Rattlesnake Buttes crossroads, 5 miles east of; 200 feet north of road, 3,000 feet east of fence corner; chiseled cross on stone 2 feet by 2 feet by 11 inches, near northwest corner of stretch of exposed rock	5, 783. 03
Rattlesnake Buttes crossroads, 5¾ miles east of; ¼ mile north of road, southeast corner of pasture; wire nail in corner fence post	5, 743. 52
S.W. ¼ sec. 15, T. 26 S., R. 62 W., 6¼ miles east of Rattlesnake Butte crossroads, ¼ mile east of head of canyon, 300 feet north of road; copper plug in rock 4 feet by 6 feet, 8 inches high; plug is marked "U.S.G.S. 5735 Ft. B.M."	5, 734. 858
Rattlesnake Butte crossroads, 7¾ miles east of; 50 feet north of road, large rock, 2 feet high, split on top; cross on south end	5, 613. 96
Rattlesnake Buttes crossroads, 8½ miles east of; 35 feet south of road; chiseled cross on northeast side of rock, 6 by 6 feet, 2½ feet high, southeast edge of a group of a dozen	5, 561. 77
Rattlesnake Buttes crossroads, 10 miles east of; south side of sec. 18, T. 26 S., R. 61 W., 650 feet north of road; copper plug in east end of rock 6 by 10 feet, 2½ feet high, on west side of group of large rocks about 8 feet high; plug is marked "U.S.G.S. 5444 Ft. B.M."	5, 443. 975
Apishapa Ford, 6¼ miles west of; ¼ miles south of road, 150 feet south of ravine, 80 feet east of dead cedar tree, on southeast side of small knoll bearing several cedar trees; chiseled cross on light rock	5, 295. 54
Apishapa Ford, 5½ miles west of; SW. ¼ sec. 15, T. 26 S., R. 61 W.; 2,000 feet south of road, 1,000 feet south of Buffalo Arroyo, on north side of rock outcrop covered with cedars and pines, 100 feet west of tree on northeast corner of group; copper plug, in light sandstone rock 15 by 8 feet, 4 feet high; plug is marked "U.S.G.S. 5215 Ft. B.M."	5, 214. 958
Buffalo Arroyo, north bank, near mouth of canyon; chiseled cross on light stone 3 by 1½ feet, 1 foot high, 20 feet north of bushy cedar tree, the tree being the third one on the north bank from road crossing below	5, 036. 59
Buffalo Arroyo, 300 feet south of road crossing; chiseled cross on rock	4, 928. 05
Apishapa Ford, 2¾ miles west of; SE. ¼ sec. 13, T. 26 S., R. 61 W., 2,000 feet southeast of road crossing over Buffalo Arroyo, 1,000 feet south of road; rock outcrop covered with cedars and cactus, 150 feet southwest of northeast corner; copper plug, in rock 25 by 12 by 4 feet, marked "U.S.G.S. 4929 Ft. B.M."	4, 928. 946
Apishapa Ford, 1¾ miles west of; 50 feet south of road; chiseled cross on black rock 30 by 10 by 3 feet	4, 841. 02
NW. ¼ sec. 21, T. 26 S., R. 60 W., 1,000 feet northeast of Apishapa Ford, 250 feet southwest of road; bronze tablet in largest rock of group near center of small knoll, marked "4814"	4, 813. 918

APISHAPA CANYON TO FOWLER.

Apishapa Ford, 2 miles northeast of; on north bank of Apishapa River, 600 feet below bend of 180°; large wire nail 10 feet above bank in cottonwood tree	4, 747. 7
Apishapa Ford, 3¼ miles northeast of; NE. ¼ sec. 3, T. 26 S., R. 60 W., near mouth of canyon, ½ mile west of river, 200 feet west of road; iron post on narrow east and west ridge, marked "4734"	4, 734. 02
NW. ¼ sec. 25, T. 25 S., R. 60 W., 1¾ miles north of adobe house, 1½ miles south of road crossing over Sanders Arroyo, ¾ mile west of river, 35 feet west of road; iron post marked "4664"	4, 664. 033

	Feet.
Sanders Arroyo, 100 feet west of mouth of; 100 feet west of river; large wire nail 5 feet above ground, in crotch of cottonwood tree	4, 614
SW. ¼ sec. 5, T. 25 S., R. 59 W., 10 feet east of corner stone; iron post marked "4605"	4, 604. 836
Northeast corner of sec. 30, T. 24 S., R. 59 W., 20 feet southwest of; iron post marked "4600"	4, 599. 838
Northeast corner of sec. 19, T. 24 S., R. 59 W., 1,700 feet south of; chiseled cross on small stone, west side of knoll	4, 606. 42
SW. corner of sec. 5, T. 24 S., R. 59 W., on top of ridge ¾ mile west of road, 1 mile south of Mustang Creek, 1 mile south 84° west of lake; iron post marked "4487"	4, 486. 913
NE. ¼ sec. 29, T. 23 S., R. 59 W., 800 feet west of road, 1 mile west of Apishapa River, on top of knoll S. 26° W. from northernmost of a group of three buttes on opposite side of river; iron post marked "4449"	4, 448. 908
Fowler, 5¾ miles south of; on east side of road, southwest corner of inclosure; large wire nail in corner fence post	4, 433. 4
Fowler, 4 miles south of; SW. ¼ sec. 4, T. 23 S., R. 59 W., ½ mile west of river, 255 feet east of road; iron post marked "4432"	4, 431. 856
East ¼ corner sec. 32, T. 22 S., R. 59 W.; nail in corner fence post	4, 416. 24
Fowler, 2 miles south of; chiseled cross on head of bolt in southwest corner of bridge over Highland ditch	4, 384. 29
Fowler railroad station, 1 mile south of; 1,200 feet south of house on east side of road; iron bolt in west side of corner fence post on east side of road	4, 358. 3
Fowler railroad station, ¾ mile south of; spike in corner fence post on west side of road, 300 feet northeast of house	4, 338. 28

FOWLER TO BOONE.

SE. ¼ sec. 17, T. 22 S., R. 59 W.; Fowler railroad station, 1,200 feet west of; 48 feet south of Atchison, Topeka and Santa Fe Railway tracks; iron post marked "4331"	4, 330. 877
Fowler railroad station, ¾ mile west of; Atchison, Topeka and Santa Fe Railway bridge No. 450, 4 feet from east end; wire nail in top of south guard rail	4, 330. 74
Fowler, 1½ miles west of; private road crossing	4, 342. 3
Fowler, 1¾ miles west of; spike in telegraph pole at Atchison, Topeka and Santa Fe milepost No. 585	4, 346. 69
Fowler, 2¾ miles west of; spike in telegraph pole at Atchison, Topeka and Santa Fe milepost No. 586	4, 340. 63
NW. ¼ sec. 12, T. 22 S., R. 60 W., 3 miles west of Fowler, 5 feet south of corner fence post at angle in county road 600 feet south of Arkansas River, 150 feet south of railroad tracks; iron post, marked "4343"	4, 342. 652
Fowler, 3¾ miles west of; nail in south side of telegraph pole at milepost No. 587	4, 352. 62
Fowler, 4½ miles west of; private road crossing	4, 350
Fowler, 4¾ miles west of; spike in telegraph pole at milepost No. 588	4, 350. 19
Fowler, 5¾ miles west of; spike in telegraph pole at milepost No. 589	4, 353. 58
Nepesta; spike in telegraph pole at milepost No. 590	4, 364. 32
NW. ¼. sec. 32, T. 21 S., R. 60 W., Nepesta; Atchison, Topeka and Santa Fe Railway bridge across Arkansas River; bronze tablet 5 feet below capstone, 15 feet above bed of river channel, east end of north pier, marked "4368"	4, 367. 81
Nepesta, 1 mile west of; iron bolt in telegraph pole at milepost No. 591	4, 377. 13
North Nepesta, intersection of the Atchison, Topeka and Santa Fe Railway with the Missouri Pacific Railway; top of southeast angle rail	4, 386. 36

	Feet.
Nepesta, 3 miles west of; wire nail in telegraph pole at milepost No. 593	4,397.23
Nepesta, 3 miles west of; road crossing near school building	4,398.6
Nepesta, 3½ miles west of; 50 feet west of center of private road, on property line between the Atchison, Topeka and Santa Fe and the Missouri Pacific railways; iron post, marked "4405"	4,404.781
Boone, 4½ miles east of; spike in telegraph pole at milepost No. 594	4,413.67
Boone, 3½ miles east of; spike in telegraph pole at milepost No. 595	4,429.77
Boone, 2½ miles east of; spike in telegraph pole at milepost No. 596	4.433.22
Boone, 1¾ miles east of; top of rail at county road crossing	4,450.9
Boone, 1½ miles east of; spike in telegraph pole at milepost No. 597	4,448.07
Boone, ¾ mile east of; county road crossing; large wire nail in south division of east cattle guard, Atchison, Topeka and Santa Fe Railway	4,457.02
Boone, top of rail in front of Missouri Pacific Railway telegraph office	4,466.2

DOYLE'S RANCH TO BUTLER'S PASTURE.

Huerfano Bridge, 1¾ miles southwest of; 75 feet east of Huerfano River, 35 feet west of foot of bluff 80 feet high, ¼ mile south of residence in Peck's pasture; spike in cottonwood tree 3 feet in diameter	4,809.55
Butler's pasture; ¾ mile southwest of Prestley's house, 250 feet east of Huerfano River, 40 feet east of abandoned irrigation trench; chiseled cross and circle on rock 2 by 3 feet	4,885.36
East side of sec. 5, T. 24 S., R. 63 W.; gate in east-and-west wire fence 284°, 250 feet, Prestley's house 7°, 1⅜ miles; copper bolt, in west end of rock 20 by 12 by 2½ feet, marked "U.S.G.S. 5019 Ft. B.M."	5,019.022
NE. cor. sec. 28, T. 23 S., R. 63 W.; 15 feet south of stone ¾ mile northeast of Prestley's house; 500 feet southeast of edge of bank of Huerfano River, ¼ mile east of Mexican's house on opposite side of river, ¼ mile west of bluff; iron post marked "4863"	4,862.915

DOYLE'S ARROYO TO MUSTANG CREEK.

Sec. 25 (north side of), T. 24 S., R. 62 W.; 1¾ miles northwest of dwelling house in Gilpen pasture, 30 feet southwest of road to Pueblo; iron post marked "4958"	4,958.089
Gilpen pasture; spike 6 inches above ground in cedar post at west end of horse trough near dwelling	4,877.2
Sec. 29 (east side of), T. 24 S., R. 61 W.; 1½ miles east of dwelling in Gilpen pasture, 60 feet south of Fowler-Cucharas road; iron post marked "4836"	4,836.054
Gilpen pasture, 2½ miles east of residence; large wire nail in south gatepost on road to Fowler	4,812.78
Sec. 24 (west side of), T. 24 S., R. 61 W.; 5 miles east of Gilpen residence, 1 mile northwest of house on "Yellow Bank" ranch, 30 feet southeast of road from Fowler to Cucharas; iron post marked "4695"	4,694.996
NE. ¼ sec. 17, T. 24 S., R. 60 W.; ⅝ mile southeast of Mustang Creek, 2¾ miles east of house on "Yellow Bank" ranch, ⅝ mile west of the east side of John Rensselaer's pasture; iron post marked "4617"	4,616.798
SE. ¼ sec. 10, T. 24 S., R. 60 W.; 1½ miles east of east edge of John Rensselaer's pasture, ⅜ mile south of Mustang Creek, 100 yards south of edge of sagebrush; iron post marked "4560"	4,559.775

GILPEN PASTURE TO SANDERS ARROYO.

SE. ¼ sec. 3, T. 25 S., R. 62 W.; 3½ miles southwest of house in Gilpen pasture, 20 feet west of road to Cucharas, at gate in west fence of pasture; iron post marked "5026"	5,026.1

	Feet.
Center of sec. 14, T. 25 S., R. 62 W.; 30 feet northeast of gate on southeast side of the Jim Peck pasture, ¼ mile southwest of Gilpen pasture; Haystack Butte 119°; North Tepee Butte 87°; iron post marked "5055"...	5, 055. 077
Sec. 16 (south side of), T. 25 S., R. 61 W.; ⅛ mile west of wire fence on east side of Gilpen pasture; North Tepee Butte, 1,000 feet, 160°; south face of bluff, 1 mile, 280°; Elm Creek Butte 213°: iron post marked "5012".	5, 012. 055
NW. ¼ sec. 13, T. 25 S., R. 61 W., 2¾ miles east of the Twin Tepee Buttes, ¾ mile northwest of Yellow Bank; on east side of Sanders Arroyo, 1,000 feet northwest of small arroyo heading at Twin Tepee Buttes; iron post, on top of slight divide, marked "4860"	4, 860. 095
NW. ¼ sec. 16, T. 25 S., R. 60 W.; 5¾ miles east of Twin Tepee Buttes, ¼ mile north of Sanders Arroyo; iron post, on edge of sagebrush, marked "4749"	4, 748. 942

APISHAPA FORD TO THATCHER.

Apishapa Ford, ¾ mile south of; 20 feet from south end and 40 feet from west edge of long rocky stream bed running northeast; chiseled cross and circle on rock	4, 865. 83
SE. ¼ sec. 3, T. 27 S., R. 60 W.; 4½ miles southeast of Apishapa Ford, ¼ mile southwest of foot of range of sawtooth hills, ½ mile west of corner of ridge; iron post marked "5117"	5, 117. 022
Apishapa Ford, 5½ miles southeast of; in gap 2 miles east of road to Thatcher, ¼ mile southwest of gate; large wire nail, 6 inches above ground, in south side of fence post	5, 217. 25
Sec. 36 (south side of), T. 27 S., R. 60 W.; 1,000 feet south of head of Christian Canyon, 45 feet east of wagon road; rock, 6 by 10 by 2½ feet high, at north end of a group of dome-shaped light sandstone rocks; copper bolt in north end marked "U.S.G.S. 5164 Ft. B.M."	5, 164. 055
NE. ¼ sec. 13, T. 28 S., R. 60 W.; 2¾ miles south of head of Christian Canyon, 30 feet east of road; Gate Butte, ¾ mile, 140°; iron post marked "5270"	5, 270. 142
Thatcher railroad station, 1½ miles north of; south side of sec. 27, T. 28 S., R. 60 W.; 700 feet west of road, 300 feet south of Rocky arroyo; copper bolt in top of south end of light sandstone rock, 1½ feet high, 130 feet east of a cedar tree; bolt is marked "U.S.G.S. 5360 Ft. B.M."	5, 360. 196
SE. ¼ sec. 4, T. 29 S., R. 60 W.; Thatcher railroad station, ¼ mile, 70°; Bloom's house, 800 feet, 22°; copper bolt in northwest end of rock 20 by 12 by 3 feet, on southeast edge of a group at east end of loose rock dam across Timpas Creek; bolt is marked "U.S.G.S. 5398 Ft. B.M."	5, 398. 063
Thatcher, ½ mile northwest of; west side of road from Thatcher to Fowler; nail in north side of gatepost	5, 434. 50

THATCHER TO RATTLESNAKE BUTTES.

Thatcher, 2 miles west of; 130 feet south of road; large wire nail near ground in crotch of half-dead cedar tree	5, 552. 17
Thatcher, 3¼ miles west of; on top of mesa 300 feet north of road; nail in south side of cedar stump	5, 683. 11
Sec. 35 (east side of), T. 28 S., R. 61 W.; 4½ miles northwest of Thatcher, 500 feet north of lake, 40 feet north of road; iron post marked "5736"	5, 736. 166
Apishapa Ford at head of canyon, 1¾ miles southeast of; 100 feet north of road, 300 feet northwest of prospecting hole; wire nail in root of solitary cedar tree	5, 527. 29
Apishapa Ford, 1¼ miles southeast of; 30 feet northeast of road near east edge of cedar ridge; wire nail in cedar snag	5, 451. 71

	Feet.
NE. ¼ sec. 20, T. 28 S., R. 61 W.; 300 feet northwest of ford of Apishapa River, 350 feet north of old corral, 1,000 feet north of abandoned adobe house (Smith's), at head of main canyon of the Apishapa River; copper bolt in rock 30 feet by 30 feet by 4 feet, 12 feet north of edge; bolt is marked "U.S.G.S. 5331 Ft. B.M."	5, 331. 035
Apishapa Ford, 2 miles northwest of; 30 feet north of road, 200 feet east of rock outcrop crossing road; chiseled cross on stone 3 by 3 by 1 foot	5, 464. 21
NW. ¼ sec. 14, T. 28 S., R. 62 W.; 3¼ miles northwest of Apishapa Ford, 300 feet north of road, 800 feet south of timbered ridge, 1,000 feet northwest of small outcropping dike; copper bolt 30 feet from west end of rock 120 by 20 feet, 3 feet high in center; bolt is marked "U.S.G.S. 5548 Ft. B.M."	5, 548. 149
Sec. 7 (west side of), T. 28 S., R. 62 W.; 1¼ miles north of cedar bluffs; copper bolt in south side of a flat sandstone rock, 1 foot above ground, near southwest corner of a ledge on north side of a prominent draw; pile of small stone on top of rock; bolt is marked "U.S.G.S. 5756 Ft. B.M."	5, 756. 104
NE. ¼ sec. 33, T. 27 S., R. 63 W.; 8 miles south of Rattlesnake Buttes, ¾ mile east of crossroads, ¼ mile northwest of abandoned cabin and corral, near dripping springs, 100 feet north of arroyo emptying in dripping spring; copper bolt 8 inches above ground in light rock at east end of a black rock 8 by 14 by 6 feet, 50 feet north of a similar rock 12 by 25 by 6 feet high; bolt marked "U.S.G.S. 5941 Ft. B.M."	5, 941. 175
SW. ¼ sec. 16, T. 27 S., R. 63 W.; 4¼ miles south of South Rattlesnake Butte, 300 feet northwest of road, 300 feet southeast of arroyo, 1,000 feet west of head of canyon; copper bolt, 15 inches from ground, in southeast corner of dark rock 25 by 10 by 10 feet, near north side of group 150 by 300 feet; bolt is marked "U.S.G.S. 5924 Ft. B.M."	5, 924. 363
Rattlesnake Buttes crossroads, 4 miles south of; 30 feet east of road, 2 feet north of forked cedar tree; chiseled cross on stone	6, 005. 85

FROM NEAR DRIPPING SPRING (8 MILES SOUTH OF RATTLESNAKE BUTTES) TO SHEEP DIP CORRALS.

Sec. 9 (center of), T. 28 S, R. 63 W., 10 miles south of Rattlesnake Buttes, 2¼ miles south of crossroads, 900 feet east of north-and-south wagon road, 20 feet northeast of a pile of loose rock 5 feet high; copper bolt in black rock 5 by 5 by 1 foot; bolt marked "U.S.G.S. 5930 Ft. B.M." Windmill 1¼ miles, 122°	5, 929. 985
SE. ¼ sec. 21, T. 28 S., R. 63 W., 1¼ miles southwest of windmill, 1,000 feet west of road, 2,000 feet southeast of an arroyo, 100 feet northeast of foot of cedar bluffs, 300 feet east of a large slabbed rock halfway up the side of bluff, northwest side of group, 20 by 8 by 4 feet; copper bolt in top of rock 3 by 7 by 1 foot; bolt marked "U.S.G.S. 5957 Ft. B.M."	5, 956. 974
SW. ¼ sec. 4, T. 29 S., R. 63 W., in gap on divide, 16 miles south of Rattlesnake Buttes, 2¼ miles west of Black Summit Butte; gap is 800 feet wide; iron post, 300 feet northeast of small dome-shaped butte, 50 feet east of road, 60 feet west of edge of timber; post is marked "6224"	6, 223. 839
Smiths Arroyo, west bank of, 500 feet northwest of Apishapa River, east end of group of trees; wire nail, 2 feet above ground, in cottonwood tree	5, 362. 72
NE. ¼ sec. 1, T. 29 S., R. 62 W., 3¼ miles southwest of abandoned adobe house, at head of Apishapa Canyon, ¾ mile northwest of Apishapa River, top of hill 20 feet high, on east face; iron post marked "5505"	5, 505. 061
Apishapa Canyon, head of, 5 miles northwest of, 70 feet east of road, ½ mile north of arroyo; wire nail in base of solitary cedar tree	5, 457. 6

	Feet.
Sec. 34 (north side of), T. 27 S., R. 62 W., east of road, 100 feet east of arroyo, 150 feet northwest of northwest corner of rocky ledge on northeast side of arroyo; triangular-shaped knoll, 100 feet on sides, 15 feet high on west side; copper plug 20 feet north of south corner, marked "U.S.G.S. 5435 Ft. B.M."	5,434.97
Sec. 24 (east side of), T. 27 S., R. 62 W., on southeast side of a prairie ridge, 1½ miles northwest of cedar ridge, 1 mile southeast of canyon, 20 feet south of north side of group of rock, in center of row of six cedar trees; copper bolt, in top of sandstone rock 12 by 10 by 2 feet; bolt is marked "U.S.G.S. 5471 Ft. B.M."	5,471.15
SW. ¼ sec. 6, T. 27 S., R. 62 W., 2½ miles south of Sanche Lake, 1,400 feet west of road, 400 feet north of arroyo, 100 feet northeast of solitary cedar tree; sandstone ledge 45 by 6 by 5 feet high, vertical on south face; copper bolt in west end, marked "U.S.G.S. 5855 Ft. B.M."	5,855.43
NE. ¼ sec. 19, T. 26 S., R. 59 W., 4½ miles east of ford at mouth of Apishapa Canyon, ½ mile south and slightly east of lake, 30 feet south of road, ½ mile west of range of yellow hills; iron post marked "4877"	4,877.298
Section 7 (center of), T. 27 S., R. 59 W., 5¼ miles south of lake, 300 feet southwest of bluffs, 1 mile southeast of southwest corner of bluffs, 30 feet from solitary cedar tree; iron post on top of slight ridge, marked "5166".	5,166.074
NW. ¼ sec. 20, T. 28 S., R. 59 W., 5½ miles northeast of Thatcher, 600 feet southwest of southwest end of pile bridge No. 62, 65 feet southeast of Atchison, Topeka and Santa Fe Railway tracks; iron post marked "5141"	5,141.063
Section 5 (east side of), T. 29 S., R. 59 W., 4½ miles east of Thatcher, 1,800 feet northwest of cabin, 450 feet south of wagon road, 1,000 feet west of arroyo, 600 feet south of branch arroyo; iron post marked "5345"	5,344.938
Thatcher, 2¼ miles east of; 500 feet northwest of Sugar Loaf Butte, 100 feet north of road, on southeast side of timber; large wire nail in pinyon tree	5,475.63
Thatcher, 1 mile east of, on north side of wagon road, 5 feet south of corner fence post; large wire nail in broken post	5,413.28
SW. corner of sec. 24, T. 29 S., R. 61 W., 4.8 miles southwest of Thatcher, 1.4 miles northwest of Atchison, Topeka and Santa Fe Railway tracks, 40 feet north of wagon road; iron post marked "5612"	5,611.981

SOUTHWESTERN COLORADO; LA PLATA MOUNTAINS.

DURANGO AND ENGINEER MOUNTAIN QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the foundation of the Smelter State Bank building in Durango and marked "6517." As based on the elevation of Denver and Rio Grande Railroad, top of track in front of Durango passenger station, which was taken as 6,503 feet above sea level, being the railroad elevation less 17 feet for error in Denver datum, the elevation of this central datum point is accepted as 6,517.003 feet. The leveling was done by Mr. Charles W. Beach, levelman, under the direction of Mr. Frank Tweedy, topographer.

DURANGO TO FLORIDA VALLEY, VIA ANIMAS CITY.

	Feet.
Durango, Smelter State Bank building, bronze tablet in second course of masonry foundation, southwest corner, marked "6517"	6,517.003
Durango, court-house; bronze tablet 1.5 feet above ground, in southwest corner of masonry foundation, marked "6551"	6,551.419

	Feet.
Animas City, top of large stone, west end of wagon bridge across Animas River, 20 feet west of Denver and Rio Grande Railroad (Silverton branch); chiseled cross	6,538.65
Animas City, 2.7 miles east of, on wagon road to Florida River, small rock 30 feet east of bridge over Spring Creek; chiseled cross	6,913.55
Animas City and Florida Valley wagon roads, 40 feet northwest of junction of, on west side of Florida Valley; iron post marked "7146"	7,146.255
Florida Valley wagon road, large flat rock on west side of, 300 feet east of ranch, 1,000 feet north of Durango wagon road, via Horse Gulch	7,054.23
Durango, 4 miles northeast of; nail in northeast corner of cattle guard on railroad spur to coal mines, south side of Durango and Florida Mesa wagon road	6,998.92

DURANGO TO LIGHTNER CREEK.

	Feet.
Durango, 5 miles west of; iron post in forks of Lightner Creek, 80 feet northwest of highway bridge crossing Dry Fork of Lightner Creek; post is marked "6944"	6,944.126
Animas City, 4¼ miles northwest of; iron post, 7 feet north of road along Junction Creek and ¼ mile below deserted sawmill, marked "7258"	7,257.619

ANIMAS CITY TO ROCKWOOD.

	Feet.
Animas City, 3.4 miles northeast of; large stone west side of road on east side of Animas Valley and 800 feet north of ranch buildings; stone is marked with chiseled cross	6,569.91
Trimble Springs, opposite small bedded stone at southwest corner of fence where road on east side of Animas Valley turns to cross Animas River; chiseled cross	6,628.17
Trimble Springs, ⅒ mile south of; large pine tree southwest corner of fence at junction of the road crossing Animas River and the main road on west side of Animas Valley; nail in root of tree	6,588.21
Trimble Springs, 2.5 miles south of; south base of large bowlder 10 by 8 by 6 feet, east side of road running along the west side of Animas Valley; iron post, marked "6569"	6,569.148
Hermosa Station, Denver and Rio Grande Railroad (Silverton branch); northeast corner of second course of masonry foundation of water tank, chiseled knob on stone	6,630.28
Hermosa Station, Denver and Rio Grande Railroad (Silverton branch); 125 feet west of tracks on south side of Durango wagon road, iron post marked "6630"	6,630.461
Rockwood, 100 feet north of; iron post, within boundaries of railroad Y-switch marked "7348"	7,347.965
Hermosa, 3½ miles northwest of; iron post 15 feet east of trail in flat north of Hermosa Creek; post is marked "7709"	7,709.481

DURANGO TO BLUFF STATION.

	Feet.
Durango, 2 miles east of; small rock opposite spring east edge of road up Horse Gulch marked with chiseled cross	7,064.78
Durango, 3¼ miles northeast of; copper plug in bedrock, 2 feet south of monument, Bluff topographic station, top of highest peak on ridge east of head of Horse Gulch; bolt is marked "U.S.G.S. 8169 Ft. B.M."	8,168.813
Rockwood station, 7.4 miles north from; copper bolt in face of granite bluff, east side of canyon of Animas River, 3 feet above Denver and Rio Grande Railroad (Silverton Branch) and 10 feet from center of track, 800 feet north of milepost 475 D; bolt is marked "U.S.G.S. 7587 Ft. B.M.".	7,587.517
Rockwood station, 5.8 miles north of; bedded limestone north end of limestone butte, west side of Rockwood-Silverton wagon road, southwest of fence corner; chiseled cross	8,602.87

WYOMING AND MONTANA.

BIG HORN BASIN.

RED LODGE AND EAGLE NEST QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the Carbon Mercantile Company's brick store at Red Lodge, Montana, marked "5548." The initial elevation for this work is a spike in the tie in front of the center of the Northern Pacific Railway Company's passenger station at Red Lodge, taken as 5,531 feet, as determined by the railroad company's levels from St. Paul. Based on this, the elevation of the central datum point is accepted as 5,547.878 feet. The leveling was done by E. W. Glafcke, levelman, under the general direction of Mr. E. M. Douglas, in charge of section.

That portion of these levels run between Eagle Nest and Cody City, via Corbett, was unchecked; being therefore unadjusted, the elevations here published are subject to correction.

RED LODGE, VIA STAGE ROAD TO CLARKS FORK BRIDGE, AT BELL'S RANCH.

	Feet.
Red Lodge, Montana; Carbon Mercantile Company's brick store; bronze tablet in stone sill, marked "5548"	5, 547. 878
Red Lodge, 2 miles south of; east edge of mesa 100 feet west of county road; iron post marked "5985"	5, 985. 364
Foster's ranch, ¼ mile southeast of; near southeast corner of sec. 10, T. 8 N., R. 20 W.; iron post marked "5665"	5, 664. 848
Cummings Creek, 150 feet due south of large cottonwood tree; bronze tablet in northeast side of large granite bowlder which has large mound of rock piled on top, can be seen for miles; datum point upper edge of tablet marked "5024"	5, 024. 407
Bell's ranch, Clarks Fork River, 1 mile west of; iron post on small knoll, entrance to gap, 100 feet south of county road marked "4085"	4, 085. 235
Bell's ranch, ¼ mile east of; east bank Clarks Fork River near bridge in fence corner; iron post marked "3999"	3, 999. 322

BELL'S RANCH, CLARKS FORK RIVER, VIA METEETSE ROAD TO EAGLES NEST.

Bell's ranch, 4 miles south of; 40 feet east of road; iron post marked "4094"	4, 093. 976
Bell's ranch, 7 miles south of; small rock set in ground edgewise, 15 feet northeast of large sandstone bowlder on which is marked "48"	4, 174
Bell's ranch, 7½ miles south of; bronze tablet set in brown sandstone rock 300 feet east of road marked "4183"	4, 183. 071
Bell's ranch, 10 miles south of; 200 feet east of county road; iron post marked "4283"	4, 283. 362
Bell's ranch, about 13 miles south of; 25 feet east of road, south bank of Sandcoulée creek; iron post marked "4340"	4, 340. 226
Bell's ranch, about 15 miles south of; on divide between Clarks Fork and Shoshone rivers, 150 feet west of road, near edge of rim; iron post marked "4805"	4, 805. 165
Eagles Nest, 8½ miles north of, 50 feet east of county road; iron post marked "4786"	4, 786. 354
Eagles Nest, 2½ miles north of; at edge of second bench north of Shoshone River, 50 feet east of road; iron post marked "4853"	4, 852. 979
Eagles Nest, ¼ mile northeast of; junction of Billings-Red Lodge road; iron post marked "4664"	4, 663. 863

EAGLES NEST, VIA BILLINGS ROAD, TO FRANNIE.

	Feet.
Eagles Nest, 3½ miles east of; 100 feet north of road; iron post marked "4552"	4,552.408
Eagles Nest, 6½ miles east of; in flat on second bench above Shoshone River, 50 feet east of road; iron post marked "4491"	4,490.796
Eagles Nest, 9½ miles east of; 100 feet south of road; iron post marked "4396"	4,396.111
Eagles Nest, 13½ miles northeast of; copper bolt in sandstone rock 150 feet southeast of road marked "U.S.G.S. 4382 Ft. B.M."	4,381.790
Eagles Nest, 17 miles northeast of; 200 feet northwest of road on edge of divide; copper bolt set in large yellow block of sandstone marked "U.S.G.S. 4442 Ft. B.M."	4,442.442
Eagles Nest, 20 miles northeast of; ½ mile north of Alkali Creek, 300 feet east of road; copper bolt set in sandstone ledge marked "U.S.G.S. 4254 Ft. B. M."	4,254.356
Frannie, 7½ miles south of; 75 feet east of road; iron post marked "4248".	4,247.858
Frannie post-office, 3 miles south of; north side of road; iron post marked "U.S.G.S. 4212 Ft. B.M."	4,212.088
Frannie post-office, 1 mile south of; 100 feet west of road; iron post marked "4191"	4,191.567
Frannie post-office, northeast corner of J. Morris's yard near picket fence; iron post marked "4212"	4,211.83

FRANNIE, VIA MONTANA-WYOMING BOUNDARY LINE, WESTWARD TO BELL'S RANCH, ON CLARKS FORK.

Frannie post-office, 4½ miles west of; sandstone rock set in ground near edge of mesa; "U.S." chiseled in side	4,674.7
Frannie post-office, 8 miles west of, on divide between Clarks Fork and Shoshone rivers; iron post marked "4785"	4,785.208
Frannie post-office, about 10 miles west of; rocky point east of mud holes in a dry creek; copper bolt in sandstone ridge marked "U.S.G.S. 4753 Ft. B.M."	4,752.639
Bell's ranch, 12 miles east of; top of mesa near large canyon heading northward; iron post marked "4882"	4,881.604
Bell's ranch, 10 miles east of; ring cut in elevated point on sandstone rock west slope of divide between Sandcoulée and Alkali creeks	4,736
Bell's ranch, 8 miles east of; ½ mile from top of ridge on west slope of divide: copper bolt marked "U.S.G.S. 4545 Ft. B.M."	4,544.107
Bell's ranch, about 5 miles east of; copper bolt set in sandstone ledge marked "U.S.G.S. 4334 Ft. B. M."	4,334.475
Bell's ranch, 3 miles east of; 1 mile east of Sandcoulée; iron post marked "4137"	4,137.351

EAGLE NEST TO CODY CITY (SHOSHONE) VIA CORBETT.

Eagle Nest, 200 feet northeast of spring; stake 75 feet northwest of road.	4,600
Eagle Nest, ¾ mile southwest of; stake, marked "B.M. 4600. U.S.G.S.," set 50 feet west of county road	4,600
Eagle Nest, 3½ miles southwest of; iron post, 100 feet west of county road, marked "4687"	4,686.998
County road, 300 feet east of, 100 feet south of sagebrush draw; stake, marked "B.M. 4700. U.S.G.S."	4,700
County road, 200 feet west of, at foot of bench, pile of rock near; stake, marked "B.M. 4700. U.S.G.S."	4,700
Corbett, 2½ miles north of bridge across Shoshone River at; iron post, 150 feet east of county road, marked "4725"	4,725.311

	Feet.
Billings and Heart Mountain county roads, junction of; iron post set in ground 22½ feet northwest of flagpole (azimuth station) on first or upper bench above Corbett; post is marked "4788"	4, 788.074
Corbett; copper bolt in sandstone, 50 feet east of north end of bridge across Shoshone River, marked "U.S.G.S. 4671 Ft. B.M."	4, 670.665
Corbett; spike driven in gage rod at point marked 6.2 feet, north end of bridge across Shoshone River	4, 659.22
Shoshone River, 500 yards south of bridge; copper bolt set in sandstone 100 feet south of road, marked "U.S.G.S. 4759 Ft. B.M."	4, 758.944
Sage Creek, 150 yards west of; copper bolt set in large quartzite bowlder embedded in the ground 250 feet south of road to Cody City, at foot of second bench 300 yards southeast of sheep pens; bolt is marked "U. S. G.S. 4889 Ft. B.M."	4, 889.005
Cody City; nail driven in top of 4 by 4 inch corner post of quarter corner, between secs. 32 and 33, T. 53 N., R. 101 W.; elevation cut in east side of post	4, 978.381
Cody City, 300 yards southeast of; canal company's bench-mark on top of stake at station 39+50. Elevation from canal company's profile, 5,574.33.	4, 995.691
Cody City, stake 100 feet to left of station 3220 of Big Horn Canyon and Southwestern Railway survey (by E. Gillette); corrected railroad elevation is 5,025.96; stake is marked "4915.96"	5, 017.819
Cody City, 200 feet south of flagpole; copper bolt set in volcanic rock at foot of second bench; two 2 by 4 inch stakes set in ground alongside of rock; bolt is marked "U.S.G.S. 5010 Ft. B.M."	5, 010.54

CENTRAL MONTANA.

BUTTE AND BOWLDER QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the foundation of the Butte County court-house, marked "5767." This is from the elevation of the bottom of a tie at a point 16 feet east of the west end of bridge No. 87 of the Northern Pacific Railway, determined by the company from Tacoma, Washington, as 5,515.94 feet. The resulting elevation of the central datum point was accepted as 5,767.451 feet. The leveling was done by Mr. F. B. Whitlock, levelman, under the direction of Mr. R. H. Chapman, topographer.

BUTTE TO WALKERVILLE.

	Feet.
Butte, court-house, B. M. I; bronze table set in foundation on south front near southwest corner of building, about 2 feet above turf in courtyard and about 6 feet east of the elevation established by the city engineer, cut in corner stone; marked "5767"	5, 767.451
Butte, Owsley Block, B. M. II; copper bolt in south face of corner stone at northeast corner of Park and Main streets, about 2 feet from sidewalk and 8 inches from corner of stone; marked "U.S.G.S. 5712 B.M"	5, 712.5
Butte, Walkerville triangulation station; bowlder with copper bolt	6, 463
Walkerville, 10 miles north of; iron post, 60 feet south of forks of road and 6 feet from road to Walkerville, about 1 mile north of J. Edward's house, marked "6724"	6, 723.94

WOODVILLE TO BERNICE VIA ELK PARK.

Woodville, Elk Park Pass; copper bolt in granite rock east of railroad track and about 80 feet south of highest point of pass, 10 feet west of road to Butte, 40 feet east of ditch; marked "U.S.G.S. 6376. B.M"	6, 375.661

	Feet.
Woodville, 3 miles north of; iron post near flagstaff in front of Gagner's house on west side of road between Woodville and Elk Park; marked "6363"	6,362.891
Woodville; nail in telegraph pole 30 feet north of railroad track at Woodville Camp	6,362.8
Woodville, 2 miles east of; iron post 3 feet west of old cabin east of road from Woodville to Jack Clinton's placer mine, marked "6509"	6,509.139
Elk Park; nail in telephone pole No. 393 near wagon road	6,263.7
Elk Park station, Montana Central Railway; iron post on north side of track between depot and water tank, marked "6229"	6,228.971
Elk Park station, 4 miles south of; iron post 75 feet from Montana Central Railway track at point where road from Elk Park to Butte crosses (first crossing south of Elk Park), marked "6268"	6,267.751
Elk Park station, 5¼ miles south of; crossing of Woodville-Elk Park wagon road and Montana Central Railway; top of tie	6,293
Bison Creek Canyon, south end of Montana Central Railway bridge No. 135; nail on cap of first bent	6.058.7
Bison Creek Canyon, Montana Central Railway bridge No. 140; nail on last bent at north end of	6,148.3
Lake Wilder; iron post 30 feet in front of pavilion, on road between Basin and Butte, west of Bison Creek, marked "5650"	5,649.674
Lake Wilder station; platform	5,733.9
Lake Wilder, ½ mile south of, in Bison Creek Canyon; top of switch block at wood spur	5,783.3
Calvin station, Northern Pacific and Montana Railway; iron post in dooryard of Calvin's ranch, 25 feet southeast of house, marked "5555"	5,555.169
Bernice station, Montana Central Railway; top of rail in front of	5,538

BERNICE TO BOULDER VIA BASIN.

Bernice, 7 miles southwest of; iron post near northeast corner of Lavatelle's house on west side of Lowland Creek and west of road to Butte, marked "6008"	6.007.689
Bernice station, Montana Central Railway, 3½ miles west of; on stake 3 feet from southwest corner of "Regiment" placer claim, on west side of main road from Basin to Deer Lodge	5.735.9
Bernice, 7 miles west of; nail on bunk house near old sawmill on east side of Lowland Creek	5.912
Bernice, 10 miles southwest of; nail on flagpole near office of Flume Company, on Lowland Creek	6,056.6
Bernice, 10 miles southwest of, on Lowland Creek; stake at corner of fence at fork of roads to Butte and to Elk Park	6.349.8
Basin, Dennis Driscoll & Co.'s store; bronze tablet in north face of corner stone at northwest corner of building about 18 inches above sidewalk, marked "5351"	5,351.294
Basin, 1¾ miles west of, bridge No. 127 of Montana Central Railway Company; nail on cap of first bent at south end of bridge	5.409.8
Basin, 2 miles east of: nail in sill of middle bent of Montana Central Railway bridge No. 121 crossing Northern Pacific Railway track	5,176.7
Basin, 7½ miles west of; iron post at forks of Basin-Deer Lodge and Basin-Butte (via Lowland Creek) roads, near Gopher mine, marked "5804"	5.803.762
Basin, 11 miles west of; iron post 150 feet west of bridge over Cottonwood Creek near its junction with the Boulder River, near Basin and Deer Lodge road, marked "6045.5"	6,045.269
Boulder, schoolhouse; bronze tablet in stone foundation near northwest corner of public school building south of court-house, marked "4904".	4,903.814

	Feet.
Boulder, 7 miles south of; nail on corner of Eberhart's house on east side of road from Boulder to Whitehall	5,292
Boulder, 2 miles south of, on Whitehall road; iron post at corner of fence south side of road to Hot Springs in yard at G. A. Douglas's place, marked "4821"	4,820.863
Boulder, divide 6 miles south of, near Whitehall road; bronze plate in large granite bowlder about 25 feet east of road, on divide between waters of Little Boulder River and Whitetail Creek, marked "5724"	5,723.909
Boulder, 8½ miles south of; iron post at fork of Whitehall and Boulder road and road to State mine, marked "5210"	5,209.622
Boulder, 10 miles southwest of, at State mine; bronze tablet in large granite bowlder 150 feet southwest of hoist and 15 feet east of middle of road; marked "6945"	6,945.046
Boulder, 7 miles southwest of; bronze tablet on granite bowlder 6 by 6 by 7 feet, 5 feet from center of road (north side) up Little Boulder River, marked "5731"	5,730.748
Boulder, 8 miles southeast of; iron post 25 feet from Edward Ryan's house, just east of Boulder River and near Finn station of Elkhorn Branch, Northern Pacific Railroad in sec. 20, T. 5 N., R. 3 W.; marked "4689"	4,688.443
Whitehall, 13 miles north of; Boulder, 15 miles south of; iron post in garden 40 feet from door of Marsh's house on west side of road from Whitehall to Boulder, marked "4830"	4,829.909
Whitehall, 10 miles north of; iron post in yard and 10 feet from J. E. Faulkner's house, on west side of road from Whitehall to Boulder, in sec. 21, T. 3 N., R. 4 W.; marked "4711"	4,711.166
Little Whitetail Park, E. W. Crosby's house, 2 miles northwest of; × cut in 40 by 20 foot rock 200 feet south of miner's cabin on east side of creek	5,720.357
Little Whitetail Park, 150 feet south of E. W. Crosby's house; bronze tablet in granite bowlder 1 by 6 by 6 feet; marked "5744"	5,743.514
Thunder Mountain, Continental Divide Triangulation station, 1½ miles west of; iron post 3 feet south of hunter's cabin in park, near head of Cottonwood Creek, 5 miles north of bridge over Cottonwood Creek near its mouth on Boulder River; marked "7302"	7,300.999

SOUTHERN TEXAS.

BEXAR, GUADALUPE, CALDWELL, GONZALES, FAYETTE, BASTROP, TRAVIS, HAYES, COMAL, MEDINA, UVALDE, BANDERA, KERR, AND KENDALL COUNTIES.

The elevations in the following lists are based on a bronze tablet set in the top of a large stone at the north side of steps at east entrance to city hall in San Antonio and marked "661.1." The initial elevation on which the work in this locality depends is an elevation established by the Southern Pacific Company at a bench mark on the southern end of east pier of Galveston, Harrisburg and San Antonio Railroad bridge over San Antonio River at San Antonio, marked with a chiseled cross. Based on this the elevation of the central datum point was accepted as 661.112 feet above mean sea level. The leveling was done by J. A. Hinman, levelman, under the general direction of Mr. E. M. Douglas, topographer in charge of the Rocky Mountain section of topography.

SAN ANTONIO, VIA CIBOLO, MARION, AND SEGUIN, TO LULING, ALONG GALVESTON, HARRISBURG, AND SAN ANTONIO RAILROAD.

	Feet.
San Antonio, southeast corner of Grand avenue and Austin streets; chiseled cross on top of curbstone	679.98
San Antonio, passenger station; top of tie in front of first section house east of	715.7
Mile board 208; spike in telegraph pole	706.44
Menger Creek; top of tie	697.8
Salado bridge, first road crossing west of; cattle guard No. 8; spike in post which first crossing post is nailed to	652.9
Milepost 206; spike in back of telegraph pole	645.53
Salado River bridge, northeast end of east rock pier; copper bolt in top of, marked "U.S.G.S. 645 ft. B.M."	645.187
Salado River, bed of	614.8
Milepost 205; spike in back of telegraph pole	662.66
Milepost 204; spike in front of telegraph pole	706.52
San Antonio and Seguin public road crossing; center of track	706.7
Milepost 203; spike in front of telegraph pole	707.8
Kerby station; center of track opposite signboard	714.9
Kerby station; spike in front of first telegraph pole east end of first cut east of station	723.09
Mile board 201, sixth telegraph pole east of; iron post 1¼ feet from wire fence immediately back of, marked "735"	735.588
Mile board 200, spike in back of fourth telegraph pole east of	758.17
Milepost 199, spike in back of ninth telegraph pole east of	738.04
Mile board 198, spike in front of third telegraph pole east of	714.64
Converse station; track in front of center of	720.4
Mile board 197; spike in front of second telegraph pole east of	709.36
Mile board 196; spike in front of fifth telegraph pole east of	757.84
Section house No. 83; center of track in front of	758.7
Mile board 195; spike in side of telegraph pole	768.32
Cattle guard No. 32; center of track at road crossing	739.1
Cibolo Creek; southwest end of west brick pier; copper bolt, marked "U.S.G.S. 725 ft. B.M."	725.047
Cibolo Creek; bed of	689
Cibolo; center of track opposite signboard	724.2
Mile board 193; spike in back of telegraph pole	708.99
Mile board 192; spike in front of telegraph pole	702.99
Cibolo; bronze tablet set in vertical rock wall, northwest corner of Charles Fromer's store, south side of Galveston, Harrisburg and San Antonio Railroad track, marked "712"	711.572
Mile board 190; spike in front of telegraph pole	696.48
Mile board 189; spike in back of telegraph pole	672.79
Cattle guard No. 62; center of track at road crossing	657.6
Mile board 188; spike in front of telegraph pole	647.02
Cattle guard No. 66; center of track at road crossing	642.3
Mile board 187, spike in front of first telegraph pole east of	648.55
Section house No. 82, center of track in front of	645.9
Marion; center of track opposite passenger depot	651.9
Marion; iron post north side of tracks, 5 feet north of first telegraph pole east of passenger station; post is marked "651"	650.905
Mile board 185, spike in front of second telegraph pole east of	640.94
Mile board 184; spike in back of telegraph pole	633.85
Mile board 183, spike in front of second telegraph pole west of	592.463
Mile board 182, spike in front of first telegraph pole west of	585.08

	Feet.
Cattle guard 82; center of track at road crossing	574.9
Hilda Siding; spike in back of third telegraph pole east of mile board 181.	557.86
Youngs Creek; top of tie trestle No. 86	552
Guadalupe River bridge; east end of west rock pier, near section house No. 81; bronze tablet, marked "552"	552.339
Guadalupe River; surface of water	508.5
Mile board 179, spike in front of first telegraph pole east of	557.87
Mile board 178; spike in back of telegraph pole	563.43
Mile board 177; spike in back of telegraph pole	567.64
Cattle guard No. 97; center of track at road crossing	563.8
Mile board 176; spike in back of telegraph pole	549.74
Seguin; iron post set in front of station 1½ feet east of fence inclosing small park and about 25 feet north of main track; post is marked "560"	560.115
Seguin; center of track opposite station	559.2
Cattle guard 104; center of track at road crossing	556.2
Cattle guard 106; center of road at crossing	556.8
Mile board 174; spike in back of telegraph pole	554.34
Geronimo Creek; bed of stream	487
Mile board 173; spike in front of telegraph pole	514.9
Mile board 172; spike in back of telegraph pole	539.79
Elka siding; center of track opposite signboard	552.3
Elka siding; iron post set 1½ feet from wire fence south of east head block. Mr. Neil resides 200 feet southeast; post is marked "558"	558.237
Mile board 170; spike in back of telegraph pole	517.43
Mile board 169, spike in back of second telegraph pole west of	515.72
Cattle guard 132; center of track at road crossing	519.7
Mile board 168, spike in back of second telegraph pole east of	554.79
Mile board 167; spike in back of telegraph pole	595.73
Seguin and Kingsbury public road crossing; center of track	606.2
Mile board 166; spike in back of telegraph pole	597.16
Kingsbury station; iron post set south of main track, 1½ feet west of small park west of station, marked "614"	614.386
Kingsbury; center of track opposite passenger depot	612.6
Mile board 164; spike in back of telegraph pole	580.31
Mile board 163; spike in front of telegraph pole	522.33
Mile board 162; spike in front of telegraph pole	489.05
Cattle guard 154; center of track at road crossing	484.6
Sullivan Siding; iron post set at southeast corner of section house No. 78, 40 feet west of head block south end of switch, marked "473"	473.471
Cattle guard 157; center of track at road crossing	464.9
Mile board 160; spike in back of telegraph pole	460.58
Mile board 159; spike in back of telegraph pole	423.5
Cattle guard 166; center of track at road crossing	409.2
San Marcos River; copper bolt set in top of rock bridge seat north end of east pier, marked "398"	390.997
San Marcos River; surface of water	358.8
Mile board 157, spike in back of fifth telegraph pole east of	390.72
Mile board 156; spike in back of telegraph pole	371.99
Mile board 155; spike in back of telegraph pole	412.687
San Antonio and Aransas Pass Railway crossing of Galveston, Harrisburg and San Antonio Railroad; center of track	419.4
Luling Station; iron post set in southwest corner of park opposite freight depot, marked "426"	418.708

LULING, VIA HARWOOD, TO FLATONIA, ALONG GALVESTON, HARRISBURG AND SAN ANTONIO RAILROAD.

	Feet.
Signboard marked "One mile to station;" spike in back of telegraph pole due south of	385.19
Section house No. 77, center of track in front of	361.3
Cattle guard 188; center of track at road crossing	354.6
Mile board 152; spike in back of telegraph pole	348.24
Plum Creek; bed of	315.4
Mile board 151; spike in back of sixth telegraph pole east of	354.51
Cattle guard 196; road crossing, center of track	397.9
Mile board 150; spike in back of second telegraph pole east of	405.184
Ivy Siding; iron post set in southwest corner of right-of-way fence, 200 feet west of west end of siding, east of Luling and Harwood County road; post marked "455"	447.397
Mile board 148; spike in back of telegraph pole	440.94
Mile board 147; spike in back of telegraph pole	420.48
Cattle guard 205; center of track at road crossing	420.7
Mile board 146, spike in back of first telegraph pole west of	427.86
Harwood Station; iron post set about 100 feet west of passenger depot, 25 feet north of track, 2 feet west of west end of park; marked "476"	468.528
Mile board 144; spike in back of telegraph pole	439.56
Mile board 142, spike in front of second telegraph pole east of	418.37
Cattle guard 224; road crossing, center of track	376.3
Sandy Fork; copper bolt set in northwest corner of rock under batter post, north end of west brick pier marked "U.S.G.S. 370 Ft. B.M."	362.976
Section house No. 75; center of track in front of	376.2
Sandy Fork; center of track, opposite signboard	366.2
Mile board 140; spike in back of telegraph pole	363.95
Cattle guard No. 234; road crossing, center of track	381
Mile-board 139; spike in front of telegraph pole	414.51
Cattle guard No. 239; center of track at road crossing	399.4
Buck Branch; iron girder span No. 244; top of tie	373.2
Mile board 138; spike in back of telegraph pole	365.82
Cattle guard No. 247; center of track at road crossing	386.9
Mile board 137; spike in back of first telegraph pole west of	374.79
Dry Branch, iron girder span No. 251; bronze tablet set in rock pedestal of west (concrete) pier, marked "374"	366.259
Mile board 135, spike in back of second telegraph pole east of	441.09
Mile board 134; spike in back of telegraph pole	422.04
Mile board 133; spike in back of telegraph pole	384.68
Welder Station; iron post at west end of small park east of passenger depot and 30 feet north of main track, marked "386"	378.493
Mile board 131; spike in back of telegraph pole	356.81
Mile board 130; spike in front of telegraph pole	354.76
Cattle guard No. 270; center of track at Welder and Flatonia road crossing	367
Mile board 129; spike in front of telegraph pole	353.01
Peach Creek, bridge No. 281 (single iron span); surface of water underneath	297
Mile board 128; spike in back of telegraph pole	313.87
Mile board 127; spike in back of telegraph pole	330.75
Piersons Siding; iron post, stamped "337," east end of siding and south of head block, 1½ feet from wire fence (this fence may be moved farther from track in time, as right-of-way fence is now being set back in places)	329.829
Mile board 125; spike in back of telegraph pole	334.73
Mile board 124; spike in back of telegraph pole	365.18

	Feet.
Section house No. 73, center of track in front of	386
Cattle guard No. 296; road crossing, center of track	393
Milepost 123; spike in front of telegraph pole	384.94
Cattle guard 299; road crossing, center of track	427
Mile board 122, spike in back of first telegraph pole west of	425.1
Flatonia, crossing of Galveston, Harrisburg and San Antonio Railroad and San Antonio and Aransas Pass Railway tracks; iron post, marked "473," on south side of Galveston, Harrisburg and San Antonio Railroad track	465.499

FLATONIA TO WEST POINT, ALONG SAN ANTONIO AND ARANSAS PASS RAILWAY.

Mile board 148; spike in front of telegraph pole	432.7
Mile board 149; spike in back of telegraph pole	398.14
McCommon; center of track, opposite signboard	398
Mile board 150; spike in back of telegraph pole	406.54
Mile board 151; spike in back of telegraph pole	401.41
Mile board 152; spike in front of telegraph pole	361.27
Mile board 153, iron post set 10 feet north of, marked "362"	364.588
Mile board 154, spike in back of first telegraph pole south of	378.8
Mile board 155; spike in back of telegraph pole	380.78
Mile board 156; spike in back of telegraph pole	368.01
Muldoon Station; bronze tablet set in vertical stone wall, southwest corner of A. B. Kerr & Sons' store, marked "351"	353.37
Mile board 158; spike in front of telegraph pole	333.68
Mile board 159, spike in first telegraph pole south of	339.42
Buckner Creek, bed of	288
Milepost 160; spike in back of telegraph pole	319.33
Lean Spur; top of tie opposite signboard	322
Trestle No. 128; bronze tablet set in solid rock 30 feet north of trestle and 35 feet west of west rail, marked "316"	318.376
Trestle No. 130; road crossing, center of track	347
Mile board 162; spike in back of telegraph pole	330.92
Muldoon wood spur, road crossing; center of track, opposite signboard	342
Mile board 163; spike in front of telegraph pole	351.41
Mile board 164; spike in back of telegraph pole	404.05
Mile board 165; spike in back of telegraph pole	388.58
Mile board 166, spike in front of fifth telegraph pole north of	351.87
West Point; center of track, opposite station	305
West Point; iron post, marked "292," set in corner of right-of-way fence, 90 feet west and 40 feet north of junction at crossing of San Antonio and Aransas Pass Railway and Missouri, Kansas and Texas Railway	294.626

WEST POINT TO BASTROP, ALONG MISSOURI, KANSAS AND TEXAS RAILWAY.

Mile board 977; spike in front of telegraph pole	293.11
Cedar Creek, bed of	279
Mile board 976; spike in back of fifth telegraph pole west of	333.37
West Point and Smithville road crossing; center of track	329
Mile board 975; spike in front of telegraph pole	322.22
Bartons Creek, bed of	271
Primms Spur; iron post, set near right-of-way fence and back of second telegraph pole east of mile-board 974, marked "316"	318.618
Mile board 973; spike in front of telegraph pole	321.77
Primms Lake, bed of	297
Mile board 972, spike in front of first telegraph pole north of	313.27
Mile board 971; spike in front of telegraph pole	323.89
Mile board 970; spike in front of telegraph pole	328.11

	Feet.
Smithville; iron post, marked "329," set 10 feet east of second telegraph pole south of mile-board 969, also second telegraph pole north of station.	331.710
Gazley Creek, bed of	328
Mile board 968, spike in front of first telegraph pole north of	330.72
Mile board 967; spike in front of telegraph pole	339.88
Mile board 966; spike in back of telegraph pole	336.55
Mile board 965, spike in front of first telegraph pole north of	361.74
Mile board 964, spike in back of first telegraph pole north of	350.63
Mile board 963; spike in back of telegraph pole	346.5
Upton siding; iron post marked "349," set near right-of-way fence and about 45 feet east of head block, south end of switch	351.591
Mile board 961, spike in front of second telegraph pole north of	376.6
Mile board 960; spike in front of telegraph pole	358.88
Mile board 959; spike in back of telegraph pole	355.5
Hills Prairie Switch; iron post, set near right-of-way fence 28 feet east of south head block, marked "359"	361.547
Mile board 958; spike in front of telegraph pole	357.42
Mile board 957; spike in front of telegraph pole	361.24
Colorado River; bed of stream	306
Colorado River bridge; east end of north bridge seat, 1¼ feet east of iron batter-post rest; copper bolt marked "U.S.G.S. 358 Ft. B.M."	360.635
Mile board 955; spike in front of telegraph pole	367.59
Mile board 954; spike in front of telegraph pole	372.38
Bastrop; center of main track opposite station	374
Bastrop court-house; bronze tablet, set in vertical brick wall northwest side of main entrance, marked "377"	379.621
Bastrop freight depot; iron post set 100 feet southeast of, and 50 feet south of Bastrop and Lagrange county road, marked "372"	374.592

BASTROP TO MANCHACA, VIA COUNTRY ROADS.

Old San Antonio road.

Bastrop; bed of Colorado River	318
Bastrop, 1⅛ miles west of; spike in front of hackberry tree 20 inches in diameter, on north side of road	372.08
Bastrop, 2.4 miles west of; spike in front of cottonwood tree 24 inches in diameter, on north side of road	376.39
Bastrop, 3 miles west of, at forks of Weberville road and old abandoned road to Garfield; iron post, set 3 feet from fence, marked "410"	412.721
Bastrop, 4.35 miles west of; spike in west side of oak tree 14 inches in diameter, with wire fence nailed to it, on north side of road	464.94
Bastrop, 5.76 miles west of; spike in front of oak tree 20 inches in diameter, north side of road	427.15
Bastrop, 6.56 miles west of, at forks of new county road to Garfield; iron post, marked "422." Permanent bench mark No. 72	424.821

Bastrop and Austin road, via Garfield.

Rocky Creek, bed of	407
Crossroads; spike in front of oak tree 10 inches in diameter, 1.04 miles northwest of B. M. No. 72	469.06
B. M. No. 72, 2.04 miles northwest of; spike in front of oak tree 20 inches in diameter, north side of road	511.43
B. M. No. 72, 3.08 miles northwest of; spike in front of oak tree 12 inches in diameter, at angle in wire fence, west side of road	545.3
B. M. No. 72, 4.14 miles northwest of; spike in front of oak tree 16 inches in diameter, west side of road	562.19

	Feet.
Caldwell, 100 feet northwest of, and 50 feet north of the Bastrop and Austin public road, via Garfield, 6.11 miles northwest of B. M. No. 72; iron post marked "576"	578.602
B. M. No. 72, 7.25 miles northwest of; spike in front of cedar stump about 30 feet high, west bank of creek and in bend of road near entrance to lane	443.58
B. M. No. 72, 8.25 miles northwest of; spike in front of elm tree 10 inches in diameter, 100 feet west of fence corner near forks and on south side of road	414.33
Elysium post-office, ½ mile east of, and 8.98 miles northwest of B. M. No. 72; spike in corner fence post (cedar) at cross lanes, 30 feet from colored church, summit of hill	502.58
Elysium, 250 feet west of, south side of road; spike in fence post	434.15
Texas Hill Triangulation station; rock marked "U.S.G.S.," 2.33 miles southwest of Elysium post-office	610.63
B. M. No. 72, 10.61 miles northwest of; spike in corner fence post at intersection of Webberville road	440.66
B. M. No. 72, 11.55 miles northwest of; spike in front of oak tree 24 inches in diameter, in angle of road	493.21
B. M. No. 72, 12.98 miles northwest of; spike in oak stump used for corner fence post, opposite frame house	496.92
Garfield; center of road front of store	494
B. M. No. 72, 14.76 miles northwest of; spike in front of telephone pole	498.92
B. M. No. 72, 15.5 miles northwest of; spike in back of oak gatepost, south of road and about ½ mile east of Onion Creek	498.3
Bastrop, 1.5 miles southwest of, at P. Pierce's residence, on settlement road at intersection with Cedar Creek and Austin road; spike in side of yard fence post near gate	513.66
Cedar Creek and Austin road.	
Onion Creek, ½ mile east of; spike in elm tree 15 inches in diameter, 50 feet west of gate entrance to pasture	456.4
Lytton Springs road, intersection of	479.1
Pilot Knobs, 1 mile east of, and 3.77 miles from the Cedar Creek and Austin road; iron post set in corner of wire fence at intersection of Creedmore road with Luling and Austin road, marked "534"	537.147
Creedmore road.	
Klines's (A. C.) gin, 1.12 miles southwest of Luling and Austin road; spike in cedar gatepost at entrance	543.01
Creedmore road; spike in gatepost east side of, 4.3 miles southwest of lower Luling and Austin road	596.31
Creedmore, center of road opposite post-office	637.6
Creedmore, junction of Creedmore and Austin and Creedmore and Manchaca roads, 5.6 miles southwest of the lower Luling and Austin road; iron post, set in southwest corner of field fence, marked "637"	639.608
Creedmore and Manchaca road.	
Creedmore, 1.5 miles northwest of; spike in corner fence post at forks of road	726.32
Creedmore, 3.88 miles northwest of; spike in corner fence post at junction of Buda and Manchaca road	683.89
Creedmore and Manchaca and Old San Antonio and Austin roads, intersection of	669

	Feet.
Creedmore and Manchaca and Old San Antonio and Austin roads, intersection of; iron post, north side, marked "649." This is 11 miles southwest of Austin, 2 miles east of Manchaca, and 5.43 miles northwest of Creedmore	651.593
Onion Creek; bed of	596
Bear Creek, International and Great Northern Railroad bridge, 7.23 miles northwest of Creedmore and 1 mile southwest of Manchaca; copper bolt, set in east end of north rock pier, marked "U.S.G.S. 651 Ft. B.M.".	653.275
Bear Creek; bed of	601
Mile board 195; spike in third telegraph pole north of	710.12
Onion Creek; bed of	666
Buda, 1,000 feet north of station; iron post, 7 feet south of telegraph pole, 35 feet east of track, 60 feet south of crossing of Old San Antonio and Austin road; marked "711"	713.719

BUDA, VIA SAN MARCOS AND GOODWIN, TO SAN ANTONIO ALONG INTERNATIONAL AND GREAT NORTHERN.

Buda; center of track opposite station	721.9
Mile board 197; spike in telegraph pole	722.96
Mile board 198; spike in telegraph pole	757.02
Mile board 199; spike in telegraph pole	740.43
Section house No. 134, center of track, front of	743.6
Mile board 200; spike in telegraph pole	741.39
Mile board 201; spike in telegraph pole	729.61
Kyle Station, one mile north of; at Kyle and Austin public-road crossing; iron post, set in corner of right-of-way fence, 40 feet east of track and 30 feet north of road; marked "713"	715.726
Kyle; center of track opposite station	721.7
Mile board 203; spike in telegraph pole	725.01
Mile board 204; spike in telgraph pole	710.33
Mile board 205; spike in telegraph pole	666.86
Mile board 206; spike in telegraph pole	643.92
Blanco River Railroad bridge; copper bolt, set in top of northeast end of north rock pier, marked "U.S.G.S. 636 Ft. B.M."	638.945
Blanco River; bed of	598
Mile board 208; spike in telegraph pole	622.76
Mile board 209, spike in first telegraph pole south of	618.77
Mile board 210; spike in telegraph pole	597.85
San Marcos River railroad bridge; copper bolt, set in west end of north rock pier, marked "U.S.G.S. 583 B.M."	585.634
San Marcos River; bed of	562
San Marcos station; center of main track opposite	588.2
Mile board 212; spike in telegraph pole	587.48
Mile board 213; spike in telegraph pole	598.98
Mile board 214; spike in first telegraph pole north of	647.80
Mile board 215; south of road crossing near; iron post, set west of track, marked "662"	664.701
Mile board 216; spike in telegraph pole	681.3
Mile board 217, spike in first telegraph pole south of	702.87
Mile board 218: spike in telegraph pole	664.35
Hays and Comal counties, boundary line; center of track, front of signboard	645
Hunter; center of track in front of station	635.5
Yorks Creek; bed of	609
Yorks Creek railroad bridge; copper bolt, set in top of west end of north rock pier near mile board 219, marked "U.S.G.S. 627 Ft. B.M."	629.513

	Feet.
Mile board 220; spike in telegraph pole	634.02
Mile board 221; spike in telegraph pole	705.40
Mile board 222, spike in first telegraph pole north of	699.30
Section house No. 136, spike in first telegraph pole south of	715.07
Mile board 224; spike in telegraph pole	707.12
Goodwin station; iron post, set 5 feet south of first telegraph pole north of, and 40 feet east of main track; marked "695"	697.856
Goodwin; center of track opposite station	698.4
Mile board 226; spike in telegraph pole	682.28
Mile board 227; spike in telegraph pole	673.55
Mile board 228, spike in first telegraph pole north of	628.94
Guadalupe River bridge; top of tie	635
Guadalupe River; bed of	582
New Braunfels; center of track front of station	644.9
Dry Comal Creek; bed of	604
Dry Comal Creek railroad bridge; copper bolt, set in top of north end of east rock pier, marked "U.S.G.S. 638 Ft. B.M."	641.028
Mile board 231, spike in second telegraph pole north of	648.04
Mile board 232, spike in first telegraph pole north of	661.01
Trestle No. 501; top of tie	680
Mile board 233, spike in second telegraph pole north of	696.54
Mile board 234; spike in telegraph pole	696.51
Mile board 234; iron post, set 5 feet south of second telegraph pole south of, and 75 feet north of trestle No. 507, marked "692"	694.78
Mile board 235, spike in fourth telegraph pole south of	707.31
Mile board 236; spike in telegraph pole	705.69
Corbyn Siding; center of track front of	716.5
Mile board 237; spike in telegraph pole	717.35
Dry Comal Creek; bed of	691
Mile board 238; spike in telegraph pole	732.12
Mile board 239; spike in telegraph pole	727.08
Mile board 240; iron post, set southeast corner of right-of-way fence at private road crossing near second telegraph pole west of; post marked "769"	771.82
Mile board 241; spike in telegraph pole	826.15
Mile board 242; spike in telegraph pole	815.23
Davenport station, center of track in front of	805.5
Cibolo River railroad bridge; copper bolt, set in southeast end of north rock pier, marked "U.S.G.S. 789 Ft. B.M."	791.576
Cibolo River; bed of	757
Mile board 244; spike in telegraph pole	809.98
Mile board 245, spike in third telegraph pole south of	872.61
Mile board 246; spike in telegraph pole	938.36
San Antonio and Austin; highest elevation on the International and Great Northern Railroad between	955
Mile board 247; spike in telegraph pole	918.68
Wetmore Siding, 1¼ miles northeast of; iron post 40 feet north of center of track, 25 feet east of road crossing, and about 1,000 feet north of church; marked "849"	851.939
Section house No. 40; center of track in front of	845.3
Mile board 249; spike in telegraph pole	825.5
Wetmore Siding; center of track in front of mail hook	824.3
Mile board 250; spike in second telegraph pole north of	820.49
Mile board 251; spike in telegraph pole	776.14
Mile board 252; spike in telegraph pole	744.08
Mile board 253; spike in telegraph pole	775.57

	Feet.
Adams Siding, about 2 miles northeast of; iron post, set 40 feet south of center track, 40 feet east of center of wagon road, 2 feet from fence, and marked "786"	788.076
Mile board 255; spike in telegraph pole	740.88
Mile board 256; spike in telegraph pole	723.97
Adams Siding; center of track in front of signboard	726
Mile board 257; spike in telegraph pole	755.53
San Antonio "City Limits" signboard, 100 feet north of; iron post, set in corner of right-of-way fence, 2 telegraph poles south of mile board 258, marked "747"	750.09
Mile board 259; spike in telegraph pole	719.10
Mile board 260; spike in telegraph pole	679.26
San Antonio, International and Great Northern Passenger Depot; center of main track in front of	664.3
San Antonio, northwest corner of intersection of West Commerce and Comal streets; spike in electric street-car company's pole	661.87

SAN MARCOS, ALONG MISSOURI, KANSAS AND TEXAS RAILWAY, TO LOCKHART, JUNCTION OF SAN ANTONIO AND ARANSAS PASS RAILWAY.

San Marcos River railroad bridge; copper bolt, set in west end of north rock pier, marked "U.S.G.S. 585 Ft. B.M."	585.634
Mile board 1020; spike in telegraph pole	603.95
Blanco River bridge; top of tie	603
Blanco River; bed of	564
Mile board 1019; spike in telegraph pole	590.28
Mile board 1018; spike in telegraph pole	584.92
Mile board 1018, 10 feet west of ninth telegraph pole east of; iron post, set 40 feet south of track and 30 feet east of wagon road	588.688
Reedville; center of track in front of station	573.2
Mile board 1016; spike in telegraph pole	572.29
Mile board 1015; spike in telegraph pole	576.04
Mile board 1014, spike in second telegraph pole east of	588.55
Maxwell; center of track in front of station	612
Maxwell; iron post, set 30 feet south of center of main track directly in front of station	611.726
Mile board 1012, spike in third telegraph pole east of	602.4
Mile board 1011; spike in telegraph pole	611.04
Mile board 1010; spike in telegraph pole	581.86
Clear Fork, trestle No. 1954; top of tie	568
Clear Fork; bed of stream	555
Clear Fork Spur; center of track at head block	574.6
San Marcos and Lockhart public road crossing; center of track	575.7
Clear Fork Spur; iron post set 400 feet east of, 25 feet north of center of track, and 50 feet south of San Marcos and Lockhart road crossing	577.673
San Marcos and Lockhart road crossing; center of track	568.4
Mile board 1008; spike in telegraph pole	564.7
Mile board 1007; spike in telegraph pole	550.83
Mile board 1006; spike in telegraph pole	535.82
Lockhart; center of track in front of station	525.5
Lockhart; iron post set 30 feet south of Missouri, Kansas and Texas Railway track, 200 feet west of transfer track of San Antonio and Aransas Pass Railway, and 40 feet west of road	512.752

LOCKHART TO LULING, ALONG SAN ANTONIO AND ARANSAS PASS RAILWAY.

Mile board 182; spike in telegraph pole	535.57
Mile board 181; spike in telegraph pole	525.36

	Feet.
Mile board 180; spike in telegraph pole	515.6
Mile board 179; spike in telegraph pole	491.94
Cattle guard No. 40; iron post, set 15 feet west of track and 40 feet south of Hales road crossing	495.81
Clear Fork; bed of	402
Mile board 177; spike in telegraph pole	432.96
Mile board 176; spike in telegraph pole	478.2
Burdette siding, center of main track in front of platform	465.7
Mile board 175; spike in telegraph pole	431.44
Lockhart and Luling public road crossing; iron post, set 25 feet east of track and 10 feet from fence	411.76
West Fork, trestle No. 133; top of tie	396
West Fork; bed of	375
Mile board 173; spike in telegraph pole	439.39
Mile board 172; spike in telegraph pole	462.52
Mile board 171; spike in telegraph pole	432.93
Mile board 170; spike in second telegraph pole north of	406.41

BASTROP TO ALUM CREEK POST-OFFICE, ALONG BASTROP AND LAGRANGE PUBLIC ROAD.

Bastrop, one mile east of, at Freeman's Park; spike in west side of west gatepost, main entrance	530.68
Bastrop, 1.64 miles east of, at forks of Bastrop and Gidding and Bastrop and Lagrange roads; spike in cedar post at corner of fence	514.78
Coppress Creek; bed of	394
Bastrop, 2.81 miles east of, 50 feet west of bridge over Coppress Creek; iron post, set 15 feet south of Bastrop and Lagrange road, marked "404".	406.584
Bastrop, 3.88 miles east of; spike in post-oak tree 30 feet north of road	545.96
Pigeon Roost Hollow; bed of	485
Milepost No. 5; spike in oak stump	511.88
Milepost No. 6; spike in oak stump	426.49
Alum Creek; bed of	333
Alum post-office, 250 feet west of and 7½ miles southeast of Bastrop; iron post, set in corner of fence 60 feet north of road, marked "354"	356.633

ALUM CREEK, NORTHEASTERLY ALONG THE ALUM CREEK-PAGE COUNTY ROAD TO INTERSECTION WITH THE BASTROP AND GIDDINGS ROAD.

Alum, 1.05 miles north of post-office; spike in back of oak tree 3 feet north of road	382.77
Alum, 2.37 miles northeast of post-office; spike in back of oak tree 16 inches in diameter, 2 feet west of road	486.29
Alum, 4.02 miles northeast of; iron post, set at intersection of Alum Creek and Page road and Bastrop and Giddings road, marked "503"	505.635

BASTROP AND GIDDINGS ROAD.

Alum Creek and Page County road, 1.92 miles west of, at intersection of Bastrop and Giddings road and Settlement road; elm tree	386.17

SETTLEMENT ROAD.

Bastrop and Giddings road, 1.14 miles north of; spike in oak fence post at corner of wire fence	433.63
Bastrop and Giddings road, 2.32 miles north of; spike in front of oak tree 18 inches in diameter 3 feet west of road	441
Elm Creek; bed of	421
Bastrop, 6½ miles northeast of, at forks of Settlement road and Bastrop and Page County road (known as the Old San Antonio road) and 4½ miles north of the Bastrop and Giddings County road; iron post, marked "486"	488.47

BASTROP AND PAGE COUNTY ROAD (OLD SAN ANTONIO ROAD).

	Feet.
Bastrop and Page County road and Settlement road, 1.29 miles south of intersection of; spike in oak tree 18 inches in diameter 4 feet to right of road	501.85
Bastrop and Page County road and Settlement road, 3.34 miles southwest of; spike in back of oak tree 20 inches in diameter 1 foot east of road	557.26
Bastrop and Page County road and Settlement road, 4.73 miles southwest of intersection of; spike in back of pine tree 24 inches in diameter 25 feet west of road	563.28

MANCHACA TO AUSTIN, ALONG INTERNATIONAL AND GREAT NORTHERN RAILROAD.

Manchaca; center of track opposite station	704.95
Manchaca; spike in telephone pole in front of station	704.95
Post marked "One mile to station;" spike in	670.23
Slaughter Creek; trestle No. 413	650
Mile board 190; spike in telegraph pole	679.46
Mile board 189; spike in telegraph pole	725.34
Mile board 188; spike in telegraph pole	726.53
Mile board 187; spike in telegraph pole	672.03
Williamson Creek railroad bridge, 6 miles north of Manchaca and 5 miles south of Austin; copper bolt top of east end of south rock pier, marked "U.S.G.S. 641 Ft. B.M."	641.226
Williamson Creek; bed of	623
Section house No. 132, at Kouns Siding; center of main track in front of.	655
Mile board 185; spike in telegraph pole	655.65
Mile board 184; spike in telegraph pole	585.56
Bastrop and Austin and Old San Antonio and Austin roads; intersection of, ½ mile south of south end of highway bridge over Colorado River at Austin	454
Austin, highway bridge over Colorado River; copper bolt set in west end of south rock pier, marked "U.S.G.S. 476 Ft. B.M."	478.051
Colorado River; bed of stream	425.32
Austin; iron post, marked "471," set 5 feet west of second telegraph pole west of the Austin and Northwestern Railroad freight depot	473.68
Austin; bronze tablet set in southwest corner of post-office, facing Colorado street, marked "508"	510.247

AUSTIN TO CEDAR VALLEY VIA OATMANVILLE.

Austin, 3.6 miles southwest of post-office; spike in telephone pole	663.9
Austin post-office building, 6.2 miles southwest of; spike in telephone pole.	710.7
Austin post-office building, 7.5 miles southwest of; spike in telephone pole.	755.99
Oak Hill (Oatmanville); center of road opposite post-office	813.5
Oak Hill, ¾ mile west of; intersection of Bee Caves and Cedar Valley roads; iron post set in corner of fence, marked "839"	839.307
Austin post-office building, 11.06 miles southwest of; spike in telephone pole	994.74
Slaughter Creek, bed of	981
Austin post-office building, 12.11 miles southwest of; spike in telephone pole	1,069.76
Cedar Valley, forks of Dripping Springs and Johnson City roads; iron post, marked "1085"	1,085.71
Cedar Valley, center of road opposite post-office	1,081

CEDAR VALLEY TO MANCHACA.

Slaughter Creek; bed of	1,004
Cedar Valley, 1.18 miles southeast of; spike in north gatepost	1,054.58
Cedar Valley, 3.62 miles southeast of; spike in north gatepost	1,035.7

	Feet.
Cedar Valley, 4.64 miles southeast of; spike in east gatepost	894.13
Cedar Valley, 5.79 miles southeast of; spike in gatepost	920.19
Cedar Valley, 7.25 miles southeast of; spike in elm tree utilized as gatepost	845.25
Cedar Valley, 8.64 miles southeast of, at crossing of Cedar Valley and Manchaca and Mountain City to Oakhill roads; iron post marked "781".	783.534
Cedar Valley, 10.27 miles southeast of, at Rosenberg's windmill; spike in gate	763.94

CEDAR VALLEY NORTHWARD, VIA BEE CAVES AND ROUND MOUNTAIN, TO STEWARTS CROSSING OF COLORADO RIVER.

Cedar Valley, 1.66 miles north of; spike in gatepost	1,092.08
Cedar Valley, 3.54 miles north of; spike in gatepost	1,047.73
Barton Creek; bed of	877
Cedar Valley, 5.26 miles north of; spike in gatepost	955.61
Main and Little Barton creeks; summit between	1,134
Little Barton Creek; bed of	928
Bee Caves; center of road opposite store	960
Bee Caves; spike in back of cedar fence post in front of store	962.29
Anderson Bend, road forks right hand to, and left hand to Hudson Bend; highest point of rock embedded in ground, marked "A 19"	960.69
Colorado River, Stewarts crossing; surface of water	535
Colorado River, Stewarts crossing; bed of stream	533

ELYSIUM, POINT ON BASTROP AND AUSTIN ROAD 1.16 MILES NORTHWEST OF, TO WEBBERVILLE.

Bastrop and Austin and Webberville roads; spike in corner fence post	440.66
Bastrop and Austin road, 1.15 miles north of; spike in elm tree, 14 inches in diameter, in lane	417.31
Colorado River, south side; top of bank	406
Webberville, opposite side of Colorado River to; spike in cottonwood, 3 feet in diameter, utilized as post for wire fence, 800 feet west of ferry, 3.55 miles north of Bastrop and Austin road via Elysium	405.51
Colorado River at Webberville; bed of stream	374
Colorado River at Webberville; surface of water	379

SAN ANTONIO.

City hall; bronze tablet on top of large stone north side of steps at east entrance, marked "661.1"	661.112
New Bexar County court-house; top of flat granite coping around first cellar window south of north entrance on east side; bronze tablet, marked "655.7"	655.694
Post-office building, corner of Houston street and avenue D; bronze tablet in southwest corner, marked "669"	669.08
Alamo Plaza, cross on southwest corner of sidewalk curbing at Hugo & Smelzer's wholesale house	665.862

LINE FROM SAN ANTONIO, ALONG GALVESTON, HARRISBURG AND SAN ANTONIO RAILROAD TO SABINAL, THENCE NORTHWARD ALONG OLD COUNTY ROAD, VIA BANDERA AND CENTER POINT, TO GANAHL, THENCE ALONG ARANSAS PASS RAILWAY TO SAN ANTONIO.

Galveston, Harrisburg and San Antonio Railroad, San Antonio to Sabinal.

San Antonio; Galveston, Harrisburg and San Antonio passenger station; top of tie in front of	683
San Antonio and Aransas Pass Railway passenger depot, 50 feet south of; nail in large mulberry tree	644.7

	Feet.
San Antonio and Aransas Pass Railway crossing; top of tie	637.42
Mile board 213; wire nail in south side of telegraph pole	637.554
Mile board 214; wire nail in south side of telegraph pole	650.458
Section house No. 86, tie in front of	663.2
Mile board 215; spike in telegraph pole	673.6
Mile board 216; wire nail in south side of telegraph pole	675.84
Mile board 216; spike in fourth telegraph pole west of; Galveston, Harrisburg and San Antonio Railroad bench mark; railroad elevation, 678.78	678.69
Main public road crossing; top of tie	682.2
San Antonio, 4 miles west of; midway between mileposts 216 and 217, near corner of right-of-way fence at San Antonio and Frio road crossing; iron post, set 40 feet south of track, marked "681"	680.892
Mile board 217; wire nail driven in south side of telegraph pole	680.79
Mile board 218; nail driven in south side of telegraph pole	671.7
Mile board 219; nail in telegraph pole	649.46
Withers, side track; top of tie in front of sign board	639.5
Mile board 220; wire nail in south side of telegraph pole	618.77
Mileposts 220 and 221, midway between; iron post, 40 feet north of track at southwest corner of section-house fence, marked "636"	635.844
Section house No. 87; tie in front of	631.3
Leons creek, trestle bridge 345; bed of creek	594
Mile board 221; wire nail in telegraph pole	654.7
Mile board 222, wire nail in first telegraph pole east of	670.04
Mile board 223, two rail lengths east of; top of tie, center of private road crossing	665.6
Mile board 223; wire nail in telegraph pole	663.12
Trestle No. 978; bed of stream	602
Mile board No. 224; wire nail in south side of telegraph pole	608.64
Section house No. 88; top of north end of tie in front of gate	622.2
Road crossing; top of tie	623
Medina River iron bridge, No. 963; bed of stream	592
Medina River, 2 miles east of; midway between mileposts 224 and 225, at crossing of San Antonio and Frio road; iron post, 50 feet north of track, in corner of right-of-way fence, marked "627"	626.758
Mile board 225; nail in front of telegraph pole	625.81
Mile board 226, nail in front of first telegraph pole east of	621.38
Road crossing; center of track	637.2
Medina River, Galveston, Harrisburg and San Antonio Railroad bridge; copper bolt set in north end of west pier (high water channel) marked "U.S.G.S. 616 Ft."	616.179
Mile board 227; nail in south side of telegraph pole	627.99
Macdona siding; center of main track in front of signboard	639.79
Mile board 228; spike driven in south side of telegraph pole	641.56
Mile board 229; spike driven in front of telegraph pole	665.9
Trestle No. 951; bed of creek	655
Mile board 230; spike driven in front of telegraph pole	665.37
Road crossing; cattle guard No. 947; center of track	667.8
Mile board 231; spike driven in south side of telegraph pole	673.44
Mile board 232; spike driven in back of telegraph pole	679.82
Idlewild station, center of track in front of	689.3
Idlewild; iron post, set in southeast corner of right-of-way fence about 40 feet south of track and 1,200 feet west of water tank, marked "692".	691.754
Road crossing; cattle guard No. 941; center of track	692.1
Mile board 233; spike driven in front of telegraph pole	697.26

	Feet.
Road crossing; cattle guard No. 939, center of track	694.9
Road crossing; center of track	713.6
Mile board No. 234; spike driven in south side of telegraph pole	717.44
Bexar-Medina County line post; 1,290 feet west of mile board No. 234; track in front of	719
Section house No. 89; center of track	720
Lacoste station; two telegraph poles east of mile board No. 235; center of truck	729.5
Mile board 235; spike driven in south side of telegraph pole	730.14
Road crossing; cattle guard No. 931; center of track	744.8
Mile board 236; spike in south side of telegraph pole	742.88
Lacoste, 2¼ miles west of; at crossing of Castroville and Devine road, midway between mileposts 237 and 238; iron post, set in southwest corner of right-of-way fence, 50 feet south of track, and marked "815"	814.625
Mile board 237, spike driven in front of second telegraph pole east of	791.35
Road crossing, cattle guard No. 925; center of track	811.6
Mile board 238, spike driven in front of first telegraph pole east of	835.75
Mile board 239, first telegraph pole east of; spike driven in west side of telegraph pole	813.99
Mile board 240, spike driven in front of telegraph pole (second pole east of milepost)	820.25
Mile board 241, spike in third telegraph pole east of	782.33
Chicon Creek bridge (one span, single deck) No. 916; elevation of ground at east pier	745
Noonans siding, ¼ mile east of, at Chicon Creek bridge; copper bolt set in top of south end of east rock pier, marked "U.S.G.S. 757 Ft. B.M."	756.096
Section house No. 90; center of track opposite gate	775.1
Noonans siding; top of tie opposite signboard	776.3
Mile board 242, spike in back of third telegraph pole west of	805.25
Mile board 243, spike in back of first telegraph pole east of	833.35
Road crossing, cattle guard No. 910; top of tie	844.8
Mile board 244; spike driven in back of telegraph pole	848.2
Mile board 245; spike driven in front of telegraph pole	831.51
Dunley, 4 miles east of; iron post set near corner of right-of-way fence 40 feet south of track, east of road crossing, between mileposts 245 and 246, marked "858"	857.772
Road crossing, cattle guard No. 903; top of tie	859.3
Mile board 246; spike driven in front of telegraph pole	868.01
Frisco Creek bridge (iron span, deck) No. 900; bed of stream	840
Mile board 247; spike in south side of telegraph pole	901.12
Mile board 248; spike driven in front of telegraph pole	958.17
Mile board 249; third telegraph pole west of; spike driven in south side	993.09
Dunley Station, 60 feet east and 30 feet south of southwest corner of depot; iron post marked "999"	998.475
Road crossing; cattle guard No. 892	994.5
Mile board 250; spike driven in back of telegraph pole	986.62
Mile board 251, spike driven in south side of second telegraph pole east of.	937.58
Mile board 252; spike driven in south side of telegraph pole	891.25
Mile board 253; spike driven in telegraph pole	852.29
Road crossing, cattle guard No. 883, center of track	848.7
Trestle No. 882; bed of creek	816
Hondo River, bridge No. 879 (two iron spans and trestle); bed of stream	795
Hondo River bridge, north end of east rock pier; copper bolt, in coping, marked "U.S.G.S. 832 Ft. B.M."	832.187
Mile board 255; spike driven in south side of telegraph pole	843.34

	Feet.
Mile board 256; second telegraph pole west of; spike driven in south side.	875.46
Mile board 257; fourth telegraph pole east of; spike driven in south side.	857.23
Mile board 258; spike driven in south side of telegraph pole	892.69
Mile board 259; spike driven in telegraph pole	893.82
Hondo depot; center of railway track	897.1
Hondo, Medina County court-house; bronze tablet, set in rock pedestal between two iron pillars, southwest corner of portico, marked "901"	901.193
Mile board 260; spike in telegraph pole	900.7
Mile board 261; spike in telegraph pole	907.2
Mile board 262; spike in telegraph pole	913.15
Mile board 263; spike in back of telegraph pole	905.77
Mile board 264, 10 feet east of; iron post, set in ground, marked "904"	903.793
Mile board 265; spike in telegraph pole	903.58
Cattle guard No. 863, private road crossing; center of track	909.5
Mile board 266; spike in telegraph post	910
Cattle guard No. 859, private road crossing; center of track	905.1
Mile board 267; spike in back of telegraph pole	893.47
Cattle guard No. 852, public road crossing; center of track	889.3
D'Hanis station; center of track in front of depot	888.4
Section house No. 93, center of track in front of	886
Mile board 268; spike in side of telegraph pole	886.33
Seco River bridge, 11 telegraph poles east of mile board 269; copper bolt set in top of north end of east rock pier marked "U.S.G.S. 889 Ft. B.M."	888.971
Seco River; bed of stream at bridge	864
Mile board 270, third telegraph pole west of; spike in front of	939.32
Mile board 271, second telegraph pole west of; spike in back of	995.4
Trestle No. 837, road crossing under; surface of road	1,013
Mile board 272; spike in back of telegraph pole	1,040.18
Seco siding; top of tie at	1,073.8
Mile board 273, first telegraph pole west of; spike in back	1,060.16
Mile board 274, 75 feet east of; iron post marked "1006"	1,006.059
Mile board 274, near third telegraph pole east of; Galveston, Harrisburg and San Antonio Railroad bench mark on live-oak tree, railroad elevation, 1,015.30	1,014.95
Section house No. 94; top of tie opposite gate	992.4
Mile board 275; spike in front of telegraph pole	984.27
Mile board 276; 800 feet east of Uvalde and Medina county line; spike in telegraph post	980.42
Mile board 277; spike in front of telegraph pole	953.3
Cattle guard 820; top of tie at road crossing	949.4
Trestle 819; bed of creek	916
Mile board 278; spike in front of telegraph pole	943.18
Trestle 817; bed of stream	925
Mile board 279; spike in back of telegraph pole	946.96
Sabinal depot, ¼ mile east of; 35 feet east of milepost 280; iron post, set to solid rock, marked "957"	957.08
Sabinal depot; top of tie in front of	963.5

Sabinal and Utopia county road.

Sabinal, 1 mile northeast of; spike in east side of south gatepost at entrance to small farmhouse, east side of road, owned by widow of C. W. Barnard	971.01
Forks of road, right hand to Utopia, left hand to Leaky; ground level at intersection	979

	Feet.
Sabinal, 2 miles northeast of; spike in mesquite tree 6 inches in diameter, 30 feet to right of road and 100 feet from where Sabinal and Utopia road bears to right from fence; rock house and windmill about 800 feet west.	980.68
Sabinal, 3 miles northeast of; spike in west gatepost, 125 feet west of Bascom Lyles's house (A. L. Cox, occupant); elevation of spike	995.95
Sabinal, 4 miles northeast of; 1,500 feet south of 2-story stone house on west side of road; spike in east gatepost	1,017.48
Sabinal, 4½ miles northeast of; forks of Sabinal-Utopia and abandoned Bandera and Sabinal county roads, 800 feet northeast of 2-story stone house owned by Bascom Lyles; iron post, in forks of road, marked "1022"	1,022.186

Sabinal and Bandera (abandoned) county road.

Sabinal, 5¼ miles northeast of; spike in west side of west gatepost.......	1,037.67
Sabinal, 6½ miles northeast of; spike in northeast side of live-oak tree, 8 inches in diameter, 5 feet south of road..............................	1,082.02
Sabinal, 7¾ miles northeast of; spike in east side of live-oak tree 14 inches in diameter, 100 feet north of road..............................	1,072.36
Sabinal, 9 miles northeast of; spike in east side of live-oak tree 18 inches in diameter, 5 feet east of road; elevation is marked on tree on side next to road	1,125.12
Sabinal, 10 miles northeast of; iron post 30 feet east of road, 45 feet west of lone live-oak tree 15 inches in diameter; tree is blazed and marked "U.S.G.S.;" iron post is stamped "1102"..............................	1,102.123
Sabinal, 11 miles northeast of; spike in west side of wild chinaberry tree 4 inches in diameter, marked "1,118.875 Ft." on east side, 15 feet west of road..............................	1,118.71
Sabinal, 11¾ miles northeast of; spike in south side of west gatepost in Reinhart's south-fence line..............................	1,154.78
Sabinal, 13 miles northeast of; spike in east side of live-oak tree 2½ feet in diameter, 35 feet west of road	1,178.08
Utopia, 12 miles northeast of; road crossing ½ mile from mouth of Little Seco River..............................	1,190
Little Seco River, bed of; at road crossing	1,168
Sabinal, 14½ miles northeast of; iron post 45 feet west of road and 300 feet north of forks of Main and Little Seco rivers marked "1168"...........	1,167.889
Sabinal, 15¼ miles northeast of; spike in east side of live-oak tree 15 feet west of road at gatepost; wire nailed to tree; gate is 1 mile north of Reinhart's residence; elevation of spike	1,221.66
Sabinal, 16.4 miles northeast of; blazed live-oak tree 20 inches in diameter, 60 feet east of road; spike in east side..............................	1,248.76
Bandera, 26 miles from; forks of road, right hand to Bandera, left hand is a "settlement road;" flat rock marked "26 miles to Bandera"	1,249
Sabinal, 17½ miles northeast of; spike in east side of north gatepost......	1,228.48
Main Seco River; bed of stream..............................	1,212
Sabinal, 18½ miles northeast of; spike in north side of mesquite tree 8 inches in diameter, 8 feet south of road..............................	1,329.68
Sabinal, 19¾ miles northeast of; spike in south side of live-oak tree 3 feet in diameter, 75 feet north of road..............................	1,311.16
Sabinal, 21 miles northeast of, at forks of road to Anton Ney; iron post marked "1338"	1,337.785
Rocky or Parkers Creek; bed of stream	1,331
Sabinal, 22¾ miles northeast of; spike in east side of gatepost south side of road	1,416.68

	Feet.
Sabinal, 24 miles northeast of; spike in north side of live-oak tree 2 feet in diameter, 30 feet south of road	1,407.84
Sabinal, 25 miles northeast of; spike in north side of live-oak tree 15 inches in diameter, 15 feet south of road	1,332.29
Sabinal, 26 miles northeast of; spike in north side of cedar gatepost north side of road	1,305.99
Sabinal, 28 miles northeast of; 500 feet east of Hondo River, 23 miles north of Hondo, crossing of old Bandera road and north and south road from Hondo to Bandera; iron post set in ground at southwest corner of intersection marked "1227"	1,226.31
Hondo River; bed of	1,204

Hondo and Bandera county road.

Sabinal, 29 miles northeast of; spike in east side of live-oak tree 18 inches in diameter, 30 feet east of road	1,257.62
Sabinal, 30 miles northeast of; spike in west gatepost	1,289.8
Sabinal, 31 miles northeast of; spike in west side of four-prong elm tree 20 inches in diameter, 50 feet east of road, ½ mile south of Widow Jeffers's house	1,294.64
Sabinal, 32½ miles northeast of; spike in south side of live-oak tree, 15 inches in diameter, 30 feet north of road	1,332.71
Sabinal, 33½ miles northeast of; spike in north side of live-oak tree 3 feet in diameter 3 feet north of road, blazed on south side	1,369.71
Sabinal, 34½ miles northeast of; spike in north side of live-oak tree 18 inches in diameter, 30 feet south of road; Commissioners Creek 50 feet south	1,417.89
Sabinal, 35½ miles northeast of; junction of Hondo and Utopia roads to Bandera near Commissioners Creek, 150 feet west of milepost No. 12 from Bandera and 400 feet north of E. A. Brewer's house; iron post set in ground northeast of road junction marked "1490"	1,489.351

Bandera and Utopia county road.

Sabinal, 36½ miles northeast of; spike in north side of milepost No. 11 from Bandera, 20 feet south of road	1,545.81
Hondo Pass, summit of; center of Utopia road	1,775
Sabinal, 37½ miles northeast of; spike in north side of tenth milepost west of Bandera, south of road	1,727.42
Bandera, 9 miles west of; spike in south side of milepost north of road	1,576.83
Bandera, eighth milepost west of; on south side of road, spike in north side.	1,581.15
Bandera, 7 miles west of; spike in north side of live-oak tree 18 inches in diameter, 6 feet south of road	1,531.98
Bandera, 100 feet east of sixth milepost west of, 500 feet east of gate; iron post, 25 feet north of road marked "1449"	1,448.611
Bandera, 5 miles west of (milepost missing); spike in south side of live-oak tree 3 feet in diameter, 50 feet north of road	1,379.43
Bandera, 4 miles west of; spike in south side of milepost, 30 feet north of road	1,363.24
Bandera, 2¾ miles west of; live-oak tree 15 inches in diameter, 10 feet south of road; spike in north side	1,284.67
Medina River; bed of stream	1,249
Bandera, 2½ miles west of; signboard in forks of road marked "32½ miles to Utopia"	1,287
Bandera, 2 miles west of, opposite milepost; spike in live-oak tree 10 inches in diameter, 20 feet south of road	1,283.66

	Feet.
Bandera, first milepost west of; 30 feet east of road; spike in north side of	1,265.47
Bandera, county court-house, bronze tablet set in side of vertical rock wall, southwest corner, marked "1265"	1,264.932

Bandera and Kerrville county road.

Bandera, 1 mile north of; spike in first milepost	1,305.32
Bandera, 2 miles north of; spike in milepost at corner of fence	1,327.86
Bandera Creek; bed of stream	1,253
Bandera, 3 miles north of; spike in milepost east side of road	1,336.81
Bandera, 4 miles north of; spike in milepost east side of road	1,364.89
Bandera, 5½ miles north of; forks of Bandera and Kerrville and Bandera and Center Point roads; iron post marked "1407"	1,406.647

Bandera and Center Point county road.

Bandera, 7 miles north of; spike in west side of milepost No. 7, 50 feet east of road	1,479.32
Bandera, 8 miles north of; spike in west side of milepost No. 8, 3 feet east of road	1,469.99
Bandera, 9 miles north of; spike in west side of milepost No. 9, 5 feet east of road	1,513.89
Bandera, 10 miles north of; spike in south side of live-oak tree 14 inches in diameter, 30 feet north of road	1,586.49
Bandera, 11 miles north of; 900 feet north of seventh milestone from Center Point; B.M. with spike cut in small oak tree 6 inches in diameter, 10 feet south of road	1,619.65
Center Point, 6 miles south of; 12 miles north of Bandera; summit of Elm Pass; iron post 25 feet west of milestone No. 6 at corner of fence marked "1744"	1,744.049
Center Point, 4 miles south of; spike in east side of live-oak tree 3 feet in diameter, 50 feet west of road, inside of pasture	1,667.62
Center Point, 3 miles south of; spike in east side of live-oak tree 15 inches in diameter, 20 feet east of road	1,632.58
Center Point, 2 miles south of; spike in east side of live-oak tree 18 inches in diameter, 25 feet west of road; wire fence is nailed to tree	1,577.4
Center Point, 1 mile south of; spike in west side of live-oak tree 3 inches in diameter in lane	1,527.9
Center Point, masonic building (stone), owned by Mrs. J. H. Hossack; bronze tablet set in northeast corner; marked "1531"	1,530.363
Guadalupe River; bed of stream at Center Point and Ganahl road crossing	1,479
Ganahl, station San Antonio and Aransas Pass Railway; top of tie in front of depot	1,516.9

San Antonio and Aransas Pass Railway, Ganahl to San Antonio.

Ganahl depot, sixth telegraph pole northwest of, at milepost 298; spike in back of telegraph pole	1,522.26
Mile board 297; spike in telegraph pole	1,499.07
Mile board 296; spike in face of telegraph pole	1,488.87
Mile board 295; spike in face of telegraph pole	1,476
Mile board 294; spike in face of telegraph pole	1,467.333
Mile board 293; spike in back of telegraph pole	1,454.32
Comfort and Kerrville highway crossing, between mile boards 292 and 291; southwest corner of intersection; iron post marked "1437"	1,436.432
Comfort and Kerrville highway; center of railroad track at crossing	1,415.9

	Feet.
Mile board 291; spike in back of telegraph pole	1,449.81
Cypress Creek; bed of stream at railroad crossing	1,404
Comfort; iron posts opposite side of track from the northwest corner of San Antonio and Aransas Pass Railway depot marked "1437"	1,436.630
Mile board 289; spike in back of telegraph pole	1,428.76
Mile board 288; spike in face of telegraph pole	1,419.28
Bridge 656; bed of stream	1,384
Mile board 287, spike in front of telegraph pole	1,385.15
Guadalupe River bridge; top of coping, west pier	1,373.45
Guadalupe River; surface of water	1,335
Guadalupe River bridge, 4½ miles southeast of Comfort; copper bolt, set in top of coping at southeast end of east pier, marked "U.S.G.S. 1374 Ft. B.M."	1,373.445
Mile board 284, spike in second telegraph pole east of	1,363.57
Mile board 283; spike in back of telegraph pole	1,353.62
Waring; center of track opposite depot	1,363.2
Mile board 282, spike in back of second telegraph pole east of	1,370.02
Waring station, 1¼ miles southeast of, crossing of Boerne and Fredericksburg highway and San Antonio and Aransas Pass Railway; iron post, 50 feet southwest of intersection, marked "1377"	1,376.193
Mile board 280, spike in back of first telegraph pole north of	1,346.93
Joseway Creek; bed of stream at railroad crossing	1,326
Trestle No. 640; top of tie	1,358.8
Trestle No. 639; top of tie	1,361.6
Mile board 279; spike in back of telegraph pole	1,383.07
Welfare siding; center of track, opposite station sign	1,407.2
Trestle No. 637; top of tie	1,422.6
Mile board 278; spike in back of telegraph pole	1,445,56
Trestle No. 630; top of tie	1,487.2
Mile board 277; spike in back of telegraph pole	1,504.95
Spanish Pass, 1¼ mile north of; first arch culvert north of milepost 276 (also first one south of negro's residence 75 feet west of railway); copper bolt, set in cap over keystone of arch at west end of culvert, marked "U.S.G.S. 1535 Ft. B.M."	1,534.160
Spanish Pass, summit; center of track	1,637.4
Mile board 274; spike in back of telegraph pole	1,578.87
Mile board 273; spike in back of telegraph pole	1,511.92
Trestle No. 620; top of tie	1,496.6
Mile board 272; spike in back of telegraph pole	1,471.85
Mile board 271; spike in back of telegraph pole	1,462.77
Boerne passenger depot; iron post 10 feet north of first telegraph pole south of, west of track; post is marked "1412"	1,412.054
Mile board 268; spike in back of second telegraph pole east of	1,376.82
Trestle No. 605; top of tie	1,359.6
Cibolo Creek; bed of stream at railroad crossing	1,305
Cibolo Creek bridge, west end of north pier; copper bolt, set in coping, marked "U.S.G.S. 1358 Ft. B.M."	1,357.251
Mile board 266; spike in back of telegraph pole	1,342.95
Mile board 265; spike in back of telegraph pole	1,339.13
Balcones Creek (bridge No. 598); bed of stream (Bexar and Kendall county line)	1,277
Mile board 264; spike in back of telegraph pole	1,310.35
Van Raub station; center of track opposite store	1,379.1
Van Raub station (store), just north of; copper bolt, set in solid rock 8 feet feet east of track, 120 feet south of fourth telegraph pole south of milepost 263; bolt is marked "U.S.G.S. 1375 Ft. B.M."	1,374.613

	Feet.
Mile board 262, spike in back of first telegraph pole north of	1,325.19
Mile board 261; spike in back of telegraph pole	1,258.72
Mile board 260; spike in front of telegraph pole	1,215.51
Mile board 259; spike in telegraph pole	1,169.54
Leon Creek, trestle No. 586; bed of stream	1,126
Aue Station, Max Aue's residence, 75 feet west of track; bronze tablet in northeast corner, marked "1141"	1,140.273
Mile board 257; spike in back of telegraph pole	1,108.05
Mile board 256; spike in back of telegraph pole	1,092.28
Mile board 255; spike in front of telegraph pole	1,081.09
Mile board 254 spike in back of telegraph pole	1,048.11
Leon Creek, trestle No. 572; bed of stream	1,016
Leon Creek, trestle (No. 572); copper bolt set in solid rock, 15 feet south of sill of trestle, on south bank, and 11 feet east of east rail, marked "U.S.G.S. 1036 ft. B.M."	1,035.556
Mile board 252; spike in back of telegraph pole	1,020.82
Mile board 251; spike in back of telegraph pole	962.13
Shavano signboard; center of track opposite	944
Mile board 250; spike in back of telegraph pole	930.76
Trestle No. 556; top of tie	896.1
Mile board 249; spike in front of telegraph pole	883.73
Mile board 248; spike in back of telegraph pole	851.05
Robards Siding, center of track opposite signboard	822.4
Mile board 247; spike in front of telegraph pole	816.93
Mile board 246; spike in back of telegraph pole	789.56
Trestle No. 545; top of tie	787
Mile board 245; spike in back of telegraph pole	784.29
Trestle No. 542; 100 feet north of and 50 feet east of track, about halfway between mileposts 244 and 245; copper bolt set in large rock, marked "U.S.G.S. 776 Ft. B.M."	775.097
Mile board 244; spike in front of telegraph pole	764.83
Trestle No. 539; top of tie	747.5
Mile board 243, spike in back of fifth telegraph pole south of	716.97
Mile board 242; spike in back of telegraph pole	712.69
Fredericksburg highway; center of track at crossing	709.2
Mile board 241; spike in front of telegraph pole	705.84
Mile board 240; spike in front of telegraph pole	675.77
San Antonio, Comal and West Commerce streets, northeast corner of; spike in street car company's pole	661.875

UVALDE AND ZAVALLA COUNTIES.

UVALDE QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the top of a large stone at the north side of steps at east entrance to city hall in San Antonio and marked "661.1." The initial elevation on which the work in this locality depends is an elevation established by the Southern Pacific Company at a bench mark on the southern end of the east pier of Galveston, Harrisburg and San Antonio Railroad bridge over San Antonio River at San Antonio, marked with a chiseled cross. Based on this the elevation of the central datum point was accepted as 661.112 feet above mean sea level. The leveling was done by Messrs. W. W. Campbell, W. R. Gresham, and J. A. Hinman, levelmen, under the general direction of Mr. T. M. Bannon, topographer.

UVALDE AND DRY FRIO CANYON ROAD.

	Feet.
Uvalde railroad station, 4 miles northeast of; iron post set 20 feet northwest of gate at fork of Uvalde and Leakey (Frio Canyon) road, stamped "1009"	1, 008. 416
Goodwin windmill, 1 mile south of; copper tack in mesquite 5 inches in diameter, 125 feet north of abandoned gate at north end of wire lane	1, 041. 275
Chilton's ranch, ¼ mile east of; iron post set in corner of fence 10 feet north of road to house, stamped "1116"	1, 116. 150
Divide between Leona Creek and Dry Frio River	1, 178
Chiltons, 1½ miles north of, at gate; spike in west gatepost	1, 172. 614
Davenport's south ranch, 1¼ miles south of; saddle	1, 283
Davenport's south ranch, ¼ mile south of, 25 feet east of gate, marked "Uvalde, 15 miles"; iron post stamped "1229"	1, 229. 022
Davenport's south ranch, 1 mile north of; saddle	1, 344
Davenport's ranch, 100 feet south of; copper tack in elm tree 15 inches in diameter 15 feet off road	1, 331. 86
Kelley's (J. F.) ranch, 200 feet south of; 20¾ miles north of Uvalde; iron post set 10 feet west of gate, stamped "1356"	1, 355. 984
Dry Frio River, bed of; opposite J. F. Kelley's	1, 328

SILVER MINE ROAD.

Robinson's (H. M.) ranch, fork of roads at; copper tack in live-oak tree 8 inches in diameter	1, 269. 04
Silver mine on divide between the two Frio rivers; copper tack in cedar tree 15 inches in diameter 10 feet north of road and 150 feet west of Silver mine	1, 454. 47

SABINAL AND LEAKEY ROAD.

Little Blanco River; crossing	1, 055.
Blanco River, 1¼ miles east of; spike in north side of north gatepost	1, 092. 24
Blanco River, 1 mile east of; copper tack in live-oak tree 1 foot in diameter, 75 feet south of road	1, 101. 05
Blanco River; crossing	1, 087
Hackberry Creek; crossing	1, 092
Hackberry ranch, 600 feet northwest of; iron post, 7 feet east of large live-oak tree at the fork of the Blanco Canyon road up Hackberry Creek, marked "1122"	1, 121. 88
Florea ranch, 1½ miles east of; chiseled cross on large, flat rock 125 feet east of divide between Hackberry Creek and Frio River	1, 204. 92
Florea ranch, 1¼ miles east of; summit of divide between Hackberry Creek and Frio River	1, 210
Florea ranch, ½ mile east of; copper tack in mesquite tree 4 inches in diameter at fork of ranch road	1, 173. 06

BLANCO CANYON ROAD.

Hackberry ranch, 2 miles north of; copper tack in east side of live-oak tree 18 inches in diameter 50 feet east of road	1, 183. 62
Hackberry ranch, 4 miles north of; iron post, 500 feet south of Enderle ranch and 20 feet south of road, stamped "1300"	1, 299. 692
Hackberry ranch, 4½ miles north of; chiseled cross on flat rock 15 feet west of road	1, 378. 63
Hackberry ranch, 5½ miles north of; Blanco River crossing	1, 301

UVALDE AND UTOPIA ROAD.

	Feet.
Blanco River, ¾ mile south of; gate at junction of roads 2 miles east of Baldwin Tank; spike in west gatepost	1,010.69
Blanco River crossing	994
Blanco River, ¾ mile northeast of; iron post marked "1016," 50 feet north of gate	1,015.781
Sabinal and Leakey road; ground at intersection of, with Uvalde and Utopia road	1,075
Kelley's (E. D.) ranch, 250 feet northwest of; iron post set inside house lot and 20 feet east of gate, stamped "1103"	1,102.705
Sabinal and Utopia road, 1¾ miles southwest from junction of Uvalde road; iron post set 50 feet south of road, 2 feet north of small mesquite tree and about 600 feet north of Sabinal River, stamped "1121"	1,120.95

RANCH ROAD, VIA BALDWIN TANK.

Umlong ranch, 2¼ miles northwest of; iron post set 50 feet north of gate on road, 300 feet east of Frio River, and about 2¼ miles west of Baldwin Tank, marked "1064"	1,063.838
Umlong ranch, 2¼ miles northwest of; bed of Frio River at road crossing 2¼ miles west of Baldwin Tank	1,037

SABINAL, UVALDE, AND LEAKEY (FRIO CANYON) ROAD.

Florea ranch, ½ mile north of; fork of Sabinal and Uvalde road	1,203
Florea ranch, ¾ mile north of; Brushy Creek crossing	1,196
Florea ranch, 1¾ miles north of; divide between Brushy Creek and Frio River	1,272
Con Can schoolhouse, 465 feet northeast of; iron post set inside of fence 10 feet south of road and marked "1252"	1,251.76
Frio River; "Shut In" crossing	1,230

UVALDE AND LEAKEY (FRIO CANYON) ROAD.

Florea ranch, ½ mile east of; iron post set in corner of pasture 10 feet southwest of road to ranch, marked "1183"	1,182.76
Florea ranch, ½ mile southeast of; Frio River crossing	1,140
Florea ranch, 4 miles south of; copper tack in live oak-tree 18 inches in diameter, 20 feet north of road and about 800 feet west of Florea's windmill	1,117.3
Florea ranch, 4½ miles south of; copper tack in mesquite tree 4 inches in diameter, 8 feet south of road crossing ½ mile southwest of Florea's windmill	1,123.06

NUECES CANYON ROAD.

Uvalde railroad station, 1¾ miles northwest of; nail in small live-oak tree 10 inches in diameter, east side of road about 200 feet north of gate at end of wire lane	942.78
Uvalde railroad station, 5 miles northeast of; east base of Benson Knob; nail in root of small mesquite tree 100 feet west of road	1,017.24
Benson Knob (Round Mountain), summit of; iron post marked "1077"	1,076.906
Benson Knob (Round Mountain), 1¼ mile northwest of; copper tack in root of large live-oak tree 65 feet west of road	1,032.93
Indian Creek, crossing of; 9 miles from Uvalde	1,021
Indian Creek, ½ mile northwest of; spike in hackberry tree 10 inches in diameter, in slough 10 feet west of road and about 220 feet south of Lewis ranch road crossing	1,024.2

	Feet.
Uvalde; ground opposite mile post 10	1,026
Uvalde, 11 miles northwest of; spike in east gatepost	1,066.2
Uvalde, 13 miles northwest of; iron post set 100 feet west of gate, stamped "1045"	1,045.01
Uvalde, 14 miles northwest of, 25 feet west of road; bed of Nueces River at bend	1,016
Uvalde, 14¾ miles northwest of; spike 20 feet west of gate between Lewis and Francis Smith & Co.'s (Molesworth) pastures	1,066.34
Uvalde, 16 miles northwest of; copper tack in catclaw tree 8 inches in diameter, 10 feet east of road and 50 feet north of milepost 16	1,075.53
Uvalde, 18½ miles northwest of; iron post set 50 feet north of gate on road to Francis Smith & Co.'s (Molesworth) ranch and ¼ mile southwest of Nueces River crossing; stamped "1126"	1,125.83
Uvalde, 19 miles northwest of; bed of Nueces River	1,099

SYCAMORE CREEK RANCH ROAD.

Laguna, 1 mile northeast of; iron post set inside of lot fence 25 feet south of Francis Smith & Co.'s (Molesworth) ranch house; stamped "1162"	1,161.85
Laguna, 3½ miles northeast of; iron post set between road and Sycamore Creek, opposite yellow bank on creek 2¾ miles northeast of Francis Smith & Co.'s (Molesworth) ranch house; stamped "1269"	1,269.081

INDIAN CREEK RANCH ROAD.

Lewis's (T. J.) ranch, near the fork of Nueces River and Indian Creek; iron post set inside of lot fence 25 feet north of house; stamped "976"	975.767
Lewis's (William) ranch, 500 feet south of; copper tack in root south side of live-oak tree 18 inches in diameter	1,091.41
Lewis's (William) ranch, 2½ miles northeast of; iron post set in lot 40 feet south of Van Ham's lower windmill, stamped "1164"	1,164.155
Lewis's (William) ranch, 5 miles north of; iron post set in lot 60 feet west of Van Ham's upper windmill, stamped "1270"	1,270.107
Lewis's (William) ranch, 6 miles northeast of; iron post, set 10 feet south of road and 25 feet east of divide between Indian Creek and Dry Frio River, about 4 miles southeast of Van Ham's upper windmill on Indian Creek, stamped "1502"	1,501.888
Lewis's (William) ranch, 8 miles north of; iron post, set in small elm grove 40 feet east of road fork, ¾ mile southeast of Francis Smith & Co.'s (Molesworth) windmill, 2 miles north of Van Ham's upper windmill, stamped "1327"	1,326.682
Francis Smith & Co.'s (Molesworth) windmill on Indian Creek, 5 miles northeast of; 800 feet west of divide between Indian Creek and Dry Frio River, 50 feet north of gate in west fence of Davenport's pasture, 900 feet north of gate in Van Ham's north pasture fence; post stamped "1609"	1,608.786
Francis Smith & Co.'s (Molesworth) windmill on Indian Creek, 5¾ miles northeast of; chiseled cross on rock 25 feet west of road in saddle on divide between Indian Creek and Dry Frio River	1,627.947

UVALDE–FORT CLARK (BRACKETTVILLE) ROAD.

Uvalde, 2½ miles west of; tack in mesquite tree south of gate to Belle Meade ranch	919.53
Uvalde, 3¾ miles west of; iron post, set by wire fence south of gate at the end of lane; marked "935"	935.562
Uvalde, 7 miles west of; bed of Nueces River at crossing	882

	Feet.
Uvalde, 8 miles west of; iron post, set under cat-claw tree on north side of road 50 feet west of road to asphalt mine, marked "919"	919.312
Uvalde, 11½ miles west of; crossing of wood slough at water hole	924
Uvalde, 12 miles west of, on saddle between two hills, 3½ miles east of Carbonville (asphalt mine); iron post, set 20 feet south of road, marked "955"	955.232
UVALDE-SMYTHE AND NUNN RANCH ROAD.	
Uvalde, 9 miles southwest of; 1¾ miles southwest of the old Tom Nunn ranch; iron post, set 18 feet west of gate between Tom Nunn and Smythe and Nunn pastures; marked "864"	864.251
Uvalde, 15 miles southwest of; Turkey Creek crossing, 500 feet east of Smythe and Nunn ranch house	835
Uvalde, 15 miles southwest of; iron post, set in lot at Smythe and Nunn ranch house on Turkey Creek, about 40 feet west of large gate, marked "848"	848.318
UVALDE AND EAGLE PASS ROAD.	
Uvalde, 1¾ miles west of; ground at northeast corner of cemetery	913
Uvalde, 5¾ miles west of; iron post, under wire fence 20 feet south of gate at fork of road to Mrs. Bates's ranch on Nueces River, marked "977"	977.555
Uvalde, 9 miles southwest of; bottom of Nueces River	805
Uvalde, 9½ miles southwest of; tack in root of stump of mesquite tree 12 inches in diameter, about 50 feet south of gate	827
Uvalde, 12½ miles southwest of; 3½ miles west of Nueces River; iron post, 30 feet north of road near cluster of mesquite bushes, on divide between Mustang and Elm or Windmill Slough, marked "889"	888.978
Uvalde, 16 miles southwest of; 250 feet east of Turkey Creek; tack in mesquite tree about 15 inches in diameter, south side of road	819.3
Uvalde, 16 miles southwest of; crossing of Turkey Creek	799
UVALDE-PIPER AND WEST RANCH (HURD WINDMILL) ROAD.	
Uvalde, 9 miles southwest of; 300 feet south of Widow Cook's house; tack in hackberry tree 6 inches in diameter, 30 feet east of gate	813.03
Uvalde, 10 miles southwest of; crossing of Nueces River 1 mile southeast of Widow Cook's house and ½ mile northeast of Piper and West River ranch	781
Uvalde, 10½ miles southwest of; iron post in corner of lot 20 feet west of Piper and West ranch house, marked "807"	807.484
Uvalde, 15½ miles southwest of; Hurd Windmill, Piper and West ranch; iron post in northeast corner of house lot, marked "792"	791.871
UVALDE AND TURK'S RANCH ROAD.	
Turk's ranch (17 miles southwest of Uvalde); tack on leaning mesquite tree about 12 inches in diameter, on line of fence about 75 feet north of Turk's windmill and water tanks	786.72
Turk's ranch, ¾ mile northeast of; bronze tablet in large rock on east end of Sand Hill; marked "868"	868.082
UVALDE AND WILDERNESS LAKE ROAD.	
Uvalde, 13 miles southwest of; crossing of Nueces River 500 feet east of McDaniel's ranch	723
Uvalde, 13 miles southwest of; iron post set in southeast corner of McDaniel's ranch house lot, marked "767"	767.052

	Feet.
Uvalde, 16 miles southwest of; 3 miles west of McDaniel's ranch, 2½ miles southwest of Habey ranch; iron post 60 feet west of road forks, 10 feet north of road, marked "806"	805.846

UVALDE AND CARRIZO SPRINGS ROAD.

Uvalde, 8 miles south of; iron post, 10 feet west of road, under a small mesquite tree, on high ridge 1½ miles north of Pulliam's windmill and water hole, marked "930"	930.219
Uvalde, 10 miles south of; 1½ miles south of Pulliam's windmill and water hole; nail in cat-claw tree at fork of road	833.09
Uvalde, 11 miles south of; 1½ miles south of Pulliam's windmill and water hole; crossing of Live Oak Creek	800
Uvalde, 11¾ miles south of; nail in small mesquite tree a few feet west of gate in Pulliam's south pasture fence	814.69
Uvalde, 14½ miles south of; ¾ miles east of 7D fence rider's house; tack in mesquite tree 8 inches in diameter, 20 feet east of road and about 200 feet south of road fork	763.78
Uvalde, 16 miles south of, and 1½ miles southeast of 7D line rider's house; iron post, 20 feet southwest of gate, marked "748"	748.802

UVALDE AND BATESVILLE (WEST SIDE OF LEONA CREEK).

Uvalde, 13 miles southwest of; iron post, on summit of high hill in northwest corner of Piper and Ellis's pasture, 2 miles west of gate on Uvalde and Batesville road, marked "964"	964.508
Uvalde, 14¾ miles south of; ground opposite Piper and Ellis's ranch house.	797
Uvalde, 16 miles south of, and 1¼ miles south of Piper and Ellis's ranch house; iron post, near corner of fence 55 feet east of gate, marked "763".	763.329
Uvalde, 4 miles south of; iron post, 10 feet east of gate, marked "890".	889.938
Uvalde, 7 miles south of; divide between Leona Creek and Camp Lake Slough	928
Uvalde, 8¾ miles south of; iron post, 10 feet east of road, under large mesquite tree, marked "864"	864.048
Uvalde, 13 miles south of, 1¾ miles north of Piper and Ellis ranch house; iron post, set 10 feet east of gate in fence between Piper and Ellis ranch and 7D ranch, marked "833"	833.072

DITCH ROAD (UVALDE, BATESVILLE, FRIOTOWN, PEARSALL) EAST SIDE OF LEONA CREEK.

Uvalde, 6 miles southeast of; iron post, 50 feet east of gate, marked "885".	884.993
Uvalde, 8½ miles southeast of; 150 feet southwest of Mayberry ranch; nail in mesquite tree 5 inches in diameter, 125 feet northeast of gate	834.5
Uvalde, 11 miles southeast of; iron post, 5 feet east of gate at Baylorsville settlement on the S. C. Bennett ranch; post is marked "826"	825.873
Uvalde, 12 miles southeast of; 1½ miles southwest of B. F. Hollingsworth ranch, at fork of Pearsall road	811
Uvalde, 21 miles southeast of; iron post, under tree 10 feet north of Leona Creek crossing, marked "753"	753.047

UVALDE-FRIOTOWN-PEARSALL ROAD.

Uvalde, 16 miles southeast of; tack in mesquite tree 7 inches in diameter 10 feet west mile-board No. 16, 300 feet northwest of gate	894.7
Uvalde, 16¾ miles southeast of; 3½ miles southeast of B. F. Hollingsworth ranch; tack in mesquite tree 5 inches in diameter, 40 feet east of crossing of Sabinal and Batesville road	889.52
Uvalde, 18½ miles southeast of; 1½ miles northwest of Lewis windmill; iron post, under a small mesquite tree 100 feet north of road and 225 feet west of Lewis ranch road, marked "891"	890.4

BURT HOLLINGSWORTH RANCH ROAD.

	Feet.
Uvalde, 20 miles southeast of; spike in mesquite tree 75 feet south of Lewis windmill	875.9
Uvalde, 21½ miles southeast of; 1½ miles southeast of Lewis windmill and 1 mile northeast of Burt Hollingsworth's house; ground at gate	825
Uvalde, 22½ miles southeast of; 250 feet southeast of Burt Hollingsworth's house and 50 feet south of gate; nail in mesquite tree 6 inches in diameter	793
Uvalde, 25 miles southeast of; 2½ miles southwest of Burt Hollingsworth's house; iron post, in northwest corner of house lot at the Old Bates ranch (now Piper and Ellis) on Live Oak Creek, marked "748"	747.809

SABINAL-BATESVILLE ROAD.

Lewis's ranch, on south side of Frio River at crossing; iron post in northwest corner of east house lot, marked "793"	793.287
Lewis's ranch, 100 feet north of; Frio River crossing, bed of stream	746
Lewis's ranch, 4 miles northeast of; 7 miles east of Englemann's ranch house; iron post 60 feet north of intersection of Uvalde-Friotown-Pearsall road; marked "812"	811.99
Lewis's ranch, on Frio River, 6 miles north of, and 3½ miles south of Dr. Wish ranch on the San Antonio road; iron post 40 feet north of fork of road to Sabinal, marked "873"	873.32

UVALDE-FRIOTOWN-PEARSALL ROAD, VIA ENGLEMANN'S.

Uvalde, 11 miles east of; ½ mile north of Englemann's house; iron post 25 feet north of small house on north bank of Frio River, marked "864"	863.992
Uvalde, 16 miles east of, and 5 miles east of Englemann's house; 20 feet east of Lewis and Dr. Wish ranch road crossing; nail in mesquite tree 15 inches in diameter, 45 feet southeast of gate	834.58

UVALDE-SABINAL-SAN ANTONIO ROAD.

Uvalde, 2¾ miles east of; iron post 375 feet east of fork of Utopia road, near a large mesquite, marked "958"	957.636
Uvalde, 6½ miles east of; 300 feet east of Frio River at the old Moore ranch; iron post 100 feet northeast of house, marked "917"	915.391
Uvalde, 14 miles east of; 300 feet south of Dr. Wish ranch house; tack in root of large live oak tree on north side of road	916.77
Sabinal, 5 miles west of; 200 feet south of W. A. Kelley's ranch house; iron post under a small mesquite tree, marked "931"	930.853

SABINAL TO UVALDE, ALONG GALVESTON, HARRISBURG AND SAN ANTONIO RAILWAY.

Sabinal River; bed of	890
Sabinal; top of tie opposite section house No. 95	935.6
Mile board 282; spike in front of telegraph pole	956.26
Mile board 283; spike in front of telegraph pole	957.26
Yucca siding; top of tie opposite signboard	975.3
Mile board 284; spike in front of telegraph pole	961.92
Mile board 285; spike in back of first telegraph pole east of	980.24
Blanco River: copper bolt in top of coping north end of east rock pier of iron bridge, marked "942"	942.337
Blanco River; bed of stream at bridge No. 901	922
Mile board 287; spike in back of telegraph pole	972.03
Mile board 288, spike in front of sixth telegraph pole west of	973.8
Mile board 289; spike in back of telegraph pole	987.84

	Feet.
Mile board 290, spike in front of fourth telegraph pole west of	983.17
Uvalde, 12 miles east of; iron post 20 feet east of the Uvalde and Utopia public road crossing, between tenth and eleventh telegraph poles west of mile board 290; marked "987"	987.237
Uvalde, 12 miles east of; center of tie at Uvalde and Utopia public road crossing between tenth and eleventh telegraph poles west of mile board 290	987.2
Chatfield siding; top of tie opposite signboard	991.2
Frio River; bed of	948
Frio River; top of coping of south end of east rock pier of iron bridge	983.39
Dry Frio River; bed of	938
Dry Frio River; top of coping at north end of west rock pier of iron bridge	982.56
Mile board 292; spike in front of telegraph pole	984.41
Elliott ranch; road crossing; top of tie at cattle guard No. 786	987.5
Mile board 293; spike in front of telegraph pole	985.94
Mile board 294; spike in front of telegraph pole	966.49
Ange siding; top of tie opposite	1,015.3
Mile board 295; spike in back of telegraph pole	976.66
Mile board 296; between eighth and ninth telegraph poles east of; iron post on south side of track, marked "965"	964.896
Mile board 297; spike in front of telegraph pole	1,015.26
Mile board 298; spike in front of telegraph pole	978.86
Mile board 299; spike in front of telegraph pole	977.12
Leona River; bed of	909
Leona River; copper bolt in top of coping north end of east rock pier of iron bridge over, marked "937"	937.168
Uvalde railroad station; top of tie in front of depot	936.7
Uvalde court-house, 30 feet east of; iron post marked "910"	910.035
Uvalde court-house; bronze tablet in rock east side of north entrance to, marked "913"	913.156

PACIFIC SECTION OF TOPOGRAPHY.

In this section, under the general direction of Mr. R. U. Goode, geographer in charge, five leveling parties were engaged during the entire season in running lines of spirit levels for the control of the topographic work in the various localities.

IDAHO.

BLAINE COUNTY.

REDFISH LAKE QUADRANGLE.

The elevations in the following list are based on an iron post set in the ground at the northwest corner of the court-house building in Hailey and marked "5418." The height of this post is based on the elevation of top of rail in front of the depot at Hailey, as brought through from sea level by the Union Pacific Railway. From this the elevation of the central datum point has been accepted as 5,418.534. The leveling was done under the general direction of Mr. E. T. Perkins, jr., topographer, by Mr. A. B. Searle, topographer.

HAILEY, ALONG CAMAS PRAIRIE ROAD, VIA DONIPHAN, TO WILLOW CREEK.

	Feet.
Hailey Hot Springs; at southwest corner of porch; iron post marked "5418"	5,418.534
Gilman; at side of house where post-office was originally located, and near forks of road; iron post marked "5547"	5,547.023
Kelly Creek Crossing, 50 feet west of; iron post marked "5857"	5,856.922
Divide between Croy and Camp creeks; south side of road; iron post marked "6114"	6,114.866
Doniphan post-office; south side of building, also used as an assay office of Camas No. 2 mine; iron post marked "5788"	5,788.444
Forks of road, Willow Creek and short cut to Soldier; about 50 feet west of a lone tree at edge of small drain; iron post marked "5094"	5,093.974

WILLOW CREEK, VIA SMOKY DISTRICT AND DOLLARHIDE MOUNTAIN, TO KETCHUM.

House of A. B. Arnold; at the west side of county road, near rail fence at end of bars, about 4 four miles north of intersection of Willow Creek and Soldier road; iron post marked "5298"	5,297.747
Willow Creek and Buttercup Mine roads, southeast corner of log house; iron post marked "5530"	5,530.596
Willow Creek and Smoky Creek divide, highest point of, about 20 feet east of road; iron post marked "6857"	6,857.009
Junction with Soldier road, opposite Soldier road crossing of Little Smoky Creek; bronze tablet set in top of bowlder marked "6365"	6,364.689
Junction with Carrie Leonard road, west side of road and about ½ mile north of junction of Carrie Leonard and Little Smoky creeks; iron post marked "6123"	6,123.185
Divide between Carrie Leonard Creek and Warm Springs Creek; iron post marked "8719"	8,718.579
About 3½ miles from summit where creek crosses road, on south side of road and near a group of large stumps; iron post marked "7281"	7,281.377
Castle Crag, 50 feet east of base of, at west side of road, midway between two creek crossings; bronze tablet set in top of rock marked "6640"	6,640.174
Upper Hot Springs, at northwest corner of old cabin, on northeast side of road, about 20 yards from creek crossing; iron post marked "6286"	6,286.317
Punch Bowl Lakes, about 1¼ miles above and 10 feet from, on southeast side of road; iron post marked "6010"	6,010.747
Ketchum bridge, across Wood River, at east end of, in top of large rock abutment; bronze tablet marked "5819"	5,819.686
Ketchum depot; nail driven in center of tie west of waiting room	5,821.02

KETCHUM TO HAILEY.

Cold Springs mill, about ¼ mile south of, at Point of Rocks; iron post marked "5690"	5,689.836
Gimlet post-office, in front yard of east building; iron post marked "5544".	5,543.733
Becker's ranch, at fence corner west of railroad track and about 20 yards south of road crossing; iron post marked "5465"	5,465.166

SMOKY DISTRICT TO HEAD OF SOLDIER CREEK.

Trail Creek and branch of Soldier Creek, divide between; iron post marked "7082"	7,081.932
Soldier Creek, John Wordrupp's corral, at southeast corner of, on south line of sec. 9, T. 14 E., R. 1 N., and about 20 feet west of forks of Soldier and Trail Creek roads; iron post marked "5366"	5,365.63

	Feet.
Little log cabin, 30 yards northwest of, at west side of wagon road where road makes right-angle turn after crossing creek near bunch of quaking asps; iron post marked "5755"	5, 755. 02
Mill, 2 miles west of, near cluster of big rocks, about 20 yards from large fir tree and 30 yards south of trail; iron post marked "6558"	6, 558. 089

SMOKY DISTRICT ALONG SOUTH BOISE TRAIL TOWARD ATLANTA.

John Worswick's Hot Springs, on Little Smoky Creek; stake set on south side of house	6, 016. 9
Worswick's, 1½ miles from, about 100 yards east of trail; iron post marked "7148"	7, 148. 267
Little and Big Smoky creeks, junction of, about 200 yards south of forks of South Boise and Big Smoky trails, in east face of rock, about 50 feet above general elevation of valley; copper plug marked "5539"	5, 539. 014
Big Smoky Creek, about 3¼ miles up, on rocky point about 100 feet above creek and about 20 yards southwest from lone fir tree; iron post marked "5822"	5, 821. 759
South Boise and Big Smoky creeks, divide between; stake near blazed tree in bunch of quaking asps	5, 975. 7
South Boise Creek, 3¾ miles above placer claim on, near lone fir tree at south side of trail on flat, and 50 yards east of creek; iron post marked "5773"	5, 772. 815
Placer claim, about 9½ miles above, at south side of trail and at base of large accumulation of slide rock, at point where the canyon begins to narrow, and where trail goes down to creek; iron post marked "6169".	6, 169. 593

KETCHUM AND SAWTOOTH ROAD.

Wood River, first bridge over (not on main road), about 40 feet northeast of east end of, and west of road, about 2½ miles from Ketchum; iron post marked "5949"	5, 948. 921
Ketchum, 3½ miles from; cross cut in large basalt rock, on west side of road, where road enters open country	6, 019
Ketchum, 6 miles from; cross cut on large basalt rock, on northeast side of road, near clump of quaking asp trees, north of Eagle Creek crossing.	6, 148. 4
Wood River, third bridge over, about 90 feet north of bridge, 30 feet east of wagon road, and 8¼ miles above Ketchum; iron post marked "6236".	6, 235. 937
Ketchum, 10 miles above; cross on small basalt rock, south of wagon road after crossing dry wash in center of large flat	6, 315. 4
Ketchum, abandoned stable about 13¼ miles above, about 40 feet north of, on top of small knoll at south end of road and west of the road crossing of Boulder Creek; iron post marked "6596"	6, 595. 866
Ketchum, old stage station, about 15 miles above, about 160 feet beyond; cross on granite rock south of road	6, 628. 4
Russian John's; nail in top of northwest end of bottom log of stable, about 18½ miles from Ketchum	6, 842. 5
Sage Hen flat, in middle of, about 100 feet north of road; cross on large isolated rock	6, 969. 8
Wood River, seventh bridge over, 30 feet west of, at top of wagon grade, on north side of road, about 2¼ miles above Ketchum; iron post marked "7020"	7, 019. 766
Galena, near southeast corner of second building west of road; iron post marked "7294"	7, 294. 195
Galena, 1½ miles west of, about 70 feet before road crosses stream; cross on large rock west of road	7, 426. 2
Wood River and Salmon River, divide between, 50 feet northwest of road; iron post marked "8795"	8, 795. 582

WASHINGTON.

KITTITAS COUNTY.

MOUNT STUART QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the top of the capstone of the United States Geological Survey astronomical pier in the grounds of the State Normal School at Ellensburg, and marked "1577." The elevation of this tablet depends on mean sea level at Tacoma, as established by levels of the Northern Pacific Railway, and is based on top of rail in front of depot at Ellensburg. The elevation of this central datum point from the above connections is 1,576.821 feet. The leveling was under the general direction of Mr. G. E. Hyde, topographer, by Mr. Frank L. Cole, levelman.

ELLENSBURG VIA M'CALLUM AND PESHASTIN DIVIDE TO BLEWETT.

	Feet.
Ellensburg, about 3 miles from, ¼ mile north of center of sec. 28, T. 18 N., R. 18 E., near corner fence post, just northwest of intersection of north and south road. A white schoolhouse is 125 feet southwest of bench mark, which is iron post marked "1576"	1,576.22
Green Canyon road, about ¾ mile southeast of intersection with the, just west of center of sec. 6, T. 18 N., R. 18 E., about 50 feet southwest of center of road; iron post marked "1841"	1,841.433
Dry Creek Canyon and Horse Canyon, divide between, near road at summit of, 22 feet north of north end of small bridge over an irrigation ditch, and in T. 19, R. 17 E., on line between secs. 9 and 16, and about 550 feet west of section corner 10, 9, 16, and 15; iron post marked "2574"	2,573.578
McCallum, about 20 feet southeast of center of intersection of road with Cle Ellum road, and 62 feet S. by SW. from door of post-office, just east of line between secs. 27 and 28, T. 20 N., R. 17 E., and about 900 feet south of the corner of secs. 22, 21, 28, and 27; iron post marked "2178"	2,178.705
First Creek bridge; nail on west end of south sill of bridge, about 1 mile north of McCallum	2,233
Swauk Creek bridge, on point of rocks, 5 feet south of; southeast end of bridge near cabin owned by John Mears, the bridge being about 1½ miles north of McCallum post-office, and at second crossing	2,293.8
Liberty post-office, 155 feet south of front door of, and 95 feet southeast from southwest corner of new house, near center of sec. 10, T. 20 N., R. 1 E.; iron post marked "2417"	2,417.137
Magnetic Spring House; nail in bottom of a pine tree on east side of road, about 200 feet north of road to, and about 3½ miles north of Liberty post-office	2,733.4
Magnetic Spring House, first ranch north of; nail on top of small pine stump, west side of road, near top of small hill just south of, and about 4½ miles north of Liberty post-office	2,901.5
Mountain Home; nail on small pine stump, west side of road, near gate to house	3,071
Swauk and Peshastin creeks, divide between, 20 feet west of road; iron post marked "4071"	4,071.435
Swauk-Peshastin Divide, first cabin north of, east side of road and opposite, about 3¾ miles south of Blewett; the cabin is on opposite side of creek from road, and four trees are blazed; iron post marked "2784"	2,784.138
Blewett post-office, 70 feet west of front door of, and 125 feet from southeast corner of engine house of stamp mill; iron post marked "2328"	2,328.256

BLEWETT DOWN PESHASTIN CREEK.

	Feet.
Blewett, second cabin below, north of; nail in root of fir stump 30 feet north of, at side of trail	2, 255. 1
Nigger Creek; point of rocks on trail leading up, 45 feet west of intersection with Peshastin Creek trail	2, 210. 8
Nigger and Ingalls creeks, highest point on trail between; nail in pine stump, about 300 feet south of, on east side of trail, about 1¼ miles north of Nigger Creek and ¾ mile south of Ingalls Creek	2, 314
Peshastin Creek, bridge over; about 80 feet south of, and 300 feet south of junction of Ingalls and Peshastin creeks, on east side of trail; trees blazed in vicinity; iron post marked "1822"	1, 822. 446
Peshastin Creek, junction of road down, with road from Camas Land, 25 feet southwest from, and 125 feet southwest from southwest end of small bridge on main road; iron post marked "1513"	1, 513. 056

PESHASTIN CREEK UP NIGGER CREEK.

Nigger Creek, first crossing of; nail in small fir stump on upper side of west end of bridge	2, 334
Nigger Creek, third crossing of; nail in cedar stump at east end of bridge on down-stream side	2, 520. 4
Three Cabins, about ¼ mile above; nail in root of double cedar tree on south bank, 350 feet above third ford and 250 feet below fourth ford	3, 050
Lindsay cabin, nail on bottom log of, at right hand side of door, and about 4 miles from mouth of creek	3, 897. 9
Nigger Creek, west end of clearing, at point where trail leaves; nail in body of large double pine tree on east side of trail, about 1 mile up stream from the Lindsay cabin	4, 111. 9
Patterson's cabin, 25 feet north of, about 7 miles up the creek and near its head; iron post marked "5769"	5, 768. 852
Nigger and Falls creeks, divide between; lowest point of	6, 067
Nigger and Falls creeks, divide between; nail in root of pine tree, 150 feet east of lowest part of	6, 120. 3
Falls and Cascade creeks, ridge between, running north from a high mountain just west of the Nigger and Falls Creek divide, and about 300 feet south and 25 feet east of highest point of north end of ridge; iron post marked "6257"	6, 257. 1

LIBERTY UP WILLIAMS CREEK ROAD.

Liberty and Mearsville, crossing of first ditch between; nail in pine stump north of road	2, 578. 1
Mearsville; nail in stump on north side of road, 70 feet north of first store	2, 670. 4
Liberty post-office, 3 miles northeast from, at intersection with Cougar Gulch road; nail in pine tree on north side of road	2, 986. 36
Williams Creek, head waters of, 20 feet east of the intersection of last road and between the two roads; iron post marked "3403"	3, 402. 78

GREEN CANYON ROAD.

Dry Creek, at forks of road, about 5 miles from, 30 feet east of intersection with road running to the west up a steep hill in west half of sec. 7, T. 19 N., R. 18 E.; iron post marked "2649"	2, 649. 391
SW. ¼ of sec. 31, T. 20 N., R. 18 E., north end of road, and about 150 feet west of house at end of road; iron post marked "3049"	3, 049. 039
Green Canyon road, ½ mile east of, at first road running from Green Canyon after leaving Dry Creek on the east side of small ravine and in the west half of sec. 31, T. 19 N., R. 18 E.; iron post marked "1967"	1, 966. 763

M'CALLUM TO TEANAWAY STATION.

	Feet.
McCallum, 1½ miles from, in center of road, road marking ¼ corner sections 20 and 29, T. 20 N., R. 17 E.; from this corner a road leads south to the mouth of Swauk Creek	2, 409.5
Teanaway River, junction with road up; in center of small triangle formed by roads; on line between secs. 24 and 25, T. 20 N., R. 16 E., and about 15 feet west of section corner on township line; iron post marked "1991"	1, 991.437
Teanaway River bridge, south side and east end of floor of. (This bridge was rebuilt soon after the elevation was obtained, and consequently it may be changed)	1, 559.9

ELLENSBURG, VIA NORTHERN PACIFIC RAILWAY, TO ROSLYN.

Ellensburg; top of rail opposite first telegraph pole south of center of depot; initial railroad elevation	1, 515.433
Thorp station, one mile southeast of, at fourth crossing Yakima River; top of rail at center of bridge No. 129	1, 629.1
Thorp, at southeast corner of the intersection of Main street and the road from Taneum Creek, in NE. ¼ sec. 11, T. 18 N., R. 17 E.; iron post marked "1640"	1, 639.591
Thorp railroad station; top of rail in front of center of.	1, 640.6
Railroad signboard "Thorp one mile;" top of south rail joint immediately opposite, 1 mile northwest of Thorp Station	1, 663.6
Thorp, 1½ miles northwest of, at first road crossing, 140 feet north of railroad close to wagon road, on the south side of SE. ¼ sec. 34, T. 19 N., R. 17 E., and very close to the township line; iron post marked "1664".	1, 664.24
Bridge No. 135, at fifth crossing of Yakima River; top of rail at center of bridge, about 2½ miles northwest of Thorp and ¾ mile southeast of Dudley	1, 697.5
Dudley Station; top of rail at rail joint, opposite center of platform	1, 709.1
Dudley station, just west of; top of milepost "Pasco Junction 138 miles, Tacoma 116 miles"	1, 721.1
Bristol station, 14.3 feet north of center of track and 40 feet southwest of southwest corner of section house and under signboard "Bristol," west side of NW. ¼ sec. 13, T. 19 N., R. 16 E.; iron post marked "1790"	1, 790.232
Teanaway station, 1 mile east of; on top of rail at western end of Teanaway River bridge	1, 830.2
Teanaway station, 200 feet north of, on section line 30 feet south of corner of secs. 4, 5, 32, and 33, T. 19 N., R. 16 E.; iron post marked "1844".	1, 843.505
Cle Elum; 84.5 feet west of the center of front door of Reed House and 81.5 feet southeast from southeast corner of Cle Elum Mercantile Company's store, in SW. ¼ sec 26, T. 20 N., R. 15 E.; iron post marked "1911"	1, 911.29
Roslyn, 221.4 feet north of the center of north doorway of new brick power house at Roslyn mines, in the center of railroad track in SE. ¼ sec. 17, T. 20 N., R. 15 E.; iron post marked "2222"	2, 222.43

TEANAWAY RIVER.

Cle Elum-Ellensburg roads, 3½ miles from; 15 feet west of junction with Ranch road running west, in SE. ¼ sec. 10, T. 20 N., R. 16 E.; iron post marked "2127"	2, 127.2
Fish Lake road, junction of; nail in top of pine stump 100 feet east of, on north side of road	2, 218.5
Cle Elum-Ellensburg road, 6½ miles from; 10 feet west of junction with Ranch road running northeast and 60 feet east of top of bluff above Teanaway River; iron post marked "2376"	2, 376.004

	Feet.
Snow ranch, second cabin above, about 250 feet west of; nail in root of crooked fir tree on east side of road	2, 636. 8
Snow ranch, about 600 feet north of third cabin above, and about 300 feet south of Stafford Creek crossing and near Teanaway River; nail in fir tree	2, 717. 8
Stafford cabin, 1 mile above, on west side of trail to Mount Stuart and about 200 feet south of where trail turns up bluff for the first time; nail in root of fir tree	2, 851. 4
Teanaway River and Beverly Creek, junction of; about 300 feet north of and 20 feet east of river; nail in root of hemlock tree	3, 060. 9
Teanaway River and Second Creek, junction of, above Beverly; 125 feet east of, 40 feet south of, and 5 feet west of trail; iron post marked "3361"	3, 360. 55
Snow ranch, 8 miles above, opposite a high rocky bluff between the upper forks of the Teanaway, on trail and 30 feet east of top of river bank; four trees blazed in vicinity; iron post marked "4248"	4, 248. 282
Teanaway River, middle fork of; about 2 miles above intersection with main fork, 10 feet north of wagon road, and about 600 feet southeast from a two-story log house, the first one occupied going up the river, just in edge of wood; iron post marked "2333"	2, 333. 196

CLE ELUM-ELLENSBURG ROAD.

Yakima River, bridge across, at Cle Elum; nail in pine stump at road corner, about 600 feet south of south end of	1, 921. 1
Cle Elum bridge, ¼ mile southeast of; nail in fir stump at forks of road at the top of bluff	1, 988. 7
Easton to Ellensburg, junction with road from; 68.5 feet west from southwest corner of a large barn and 43.5 feet north of prominent fence corner in NW. ¼ sec. 2, T. 19 N., R. 15 E.; iron post marked "2070"	2, 069. 613

TANEUM CREEK ROAD.

Ellensburg to Easton, intersection with road from; near center of sec. 4, T. 18 N., R. 17 E.; iron post marked "1837"	1, 836. 749
Taneum Creek schoolhouse, first house above; about 1,000 feet southwest from and on south side of creek in a clump of small pines. The house is 1¼ miles west of the Ellensburg-Easton road and on north bank of creek and about 1,200 feet south-southwest from the northeast corner of T. 18 N., R. 16 E.; iron post marked "2046"	2, 046. 142

OREGON-WASHINGTON.

MULTNOMAH AND CLARK COUNTIES.

PORTLAND QUADRANGLE.

The elevations in the following list are based on a bronze tablet in the stone base of the central pillar of the Fifth street entrance to the city hall in Portland, marked "75." Its height is referred to mean sea level through levels of the Northern Pacific Railway connecting Portland with the United States Coast and Geodetic Survey tidal gage at Astoria. They are dependent primarily on the top of 2-mile post, Front street, Portland, taken as 32.50 feet above mean low water at Astoria, to which a difference of 4.38 feet is applied to bring it to mean sea level, giving its resulting elevation 28.12 feet. Dependent on this result, the elevation of the central datum point is accepted as 74.385 feet above mean sea level. The leveling was done under the general direction of Mr. E. C. Barnard, topographer, by Mr. C. O. Ward, levelman.

PORTLAND.

	Feet.
In top of 2-mile stone on south side of Front street, near Seventeenth, opposite E. & J. A. Martin's lumber mill; copper bolt marked "28"	28.073
In top of stone pier at south side of east end of the Oregon Railroad and Navigation Company's steel railroad bridge across the Willamette River, 0.04 feet from edge of stone; copper bolt stamped "29"	28.94
In stone base of center pillar of Fifth street entrance to city hall; bronze tablet marked "75"	74.385
In stone base of iron water tower, corner of Schuyler and Thirteenth streets, 3.7 feet in front of post at foot of stairway, and 3.3 feet from base of tower; copper bolt marked "145"	144.927
In stone foundation at left of entrance to university; bronze tablet marked "175"	175.258

PORTLAND, ALONG COLUMBIA SLOUGH AND BASE LINE ROADS TO CITY BOUNDARY.

Portland; 3 feet from corner of fence at northeast angle of crossing of Vancouver avenue and Columbia Slough road; iron post marked "42"	42.06
Sandy and Columbia Slough roads, intersection of; southwest corner of yard to large white house north of road; iron post marked "72"	72.21
Townships 2 and 3 E., wagon road on line between; head of nail driven in root of three-pronged maple tree on east side of road and about 60 feet south of Oregon Railroad and Navigation Company's track	177.6
Township corner, T. 1 N., T. 1 S., R. 2 and 3 E., corner of rail fence at southeast angle of crossroads; iron post marked "251"	251.089
8-mile stone, top of southeast corner of	300.5
7-mile stone, top of	293.3
6-mile stone, top of	278
5-mile stone, peg at base of	260.8
4-mile stone, top of	299.7
City boundary, south side of road, in northwest corner of orchard, 2½ feet from the fences in the northwest corner of sec. 6, T. 1 S., R. 2 E; iron post marked "177"	177.155

UNITED STATES MILITARY RESERVATION AT VANCOUVER.

Columbia River; head of nail in cottonwood stump 14 inches in diameter, on north bank of, in Chinese vegetable garden east of Vancouver	15.7
Reservation, northwest corner of; top of stone post 8 by 8 inches and 3 feet high, at	26.3
Quartermaster's and commissary buildings, 6.9 feet south of sexagonal building and 70 feet from the adjoining front corners of the; iron post marked "26"	26.376

VANCOUVER, ALONG VANCOUVER, KLICKITAT AND NORTHERN RAILROAD TO BRUSH PRAIRIE.

Vancouver, in base of stone column at right of main entrance to Clarke County court-house; bronze tablet marked "73"	73.009
Minnehaha Siding, about 60 feet west of; head of nail driven in root of fir stump 27 inches in diameter, 8 feet west of railroad track and 8 feet north of wagon road crossing	247.7
Section 6, T. 2 N., R. 2 E., road crossing in; head of nail driven in fir stump 3 feet in diameter, 10 feet southeast of railroad at road crossing	281.5

	Feet.
Thornton's ranch; head of spike driven in northeast corner of cattle guard at road crossing, in sec. 32, T. 3 N., R. 2 E	204
Brush Prairie post-office; head of nail driven in fir stump 36 inches in diameter, 40 feet north of railroad and 100 feet west of Battle Ground road	292.8

BRUSH PRAIRIE, ALONG FISHERS LANDING AND FORT PLAIN ROADS, TO VANCOUVER.

Sections 13, 14, 23, and 24, T. 3 N., R. 2 E., corner of, in fence corner at southeast angle of road intersection and 50 feet from section corner; iron post marked "299"	298.639
Sections 25, 26, 35, and 36, T. 3 N., R. 2 E., corner of; head of nail in root of fir stump, 10 feet west of road and 40 feet south of Union Schoolhouse road	276
Section 11, T. 2 N., R. 2 E., at northwest angle of road intersection, near west side of, and 21 feet west of Donation Claim corner; iron post marked "218"	217.865
Section 12, T. 2 N., R. 2 E.; head of nail driven in fir tree, 28 inches in diameter, 10 feet north of forks of road, near center of section	210.3
Sections 24 and 25, T. 2 N., R. 2 E., ¼ corner between, in fence corner at southwest angle of crossroads, 102 feet from house; iron post marked "303"	303.314
La Camas road, intersection with, at southeast angle, in section 19, T. 2 N., R. 2 E.; iron post marked "206"	205.736
Section 19, T. 2 N., R. 2 E.; head of nail on top of fir stump 16 inches in diameter, on north side of road, 75 feet west of crossroads	177.7
United States water tank; head of nail in root of fir stump 2 feet in diameter, at southwest corner of forks of road	175

VANCOUVER, ALONG RIVER AND ST. JOHNS ROADS, TO BRUSH PRAIRIE.

Burnt Bridge Creek; head of nail in root of fir stump 3 feet in diameter, in southwest angle of first crossroads north of creek, near ¼ corner on line between secs. 4 and 9, T. 2 N., R. 1 E	37.4
Secrist schoolhouse, in corner of yard, 2½ feet from fence and 60 feet from corner of the schoolhouse, at forks of road, in sec. 4, T. 2 N., R. 1 E.; iron post marked "212"	211.796
Secs. 28, 29, 32, and 33, T. 3 N., R. 1 E., corner of; head of nail in fir stump 3 feet in diameter, north of road forks	198.9
Salmon Creek, trestle over. east of road at north end of, 25 feet from mudsill at north end of trestle and 10 feet from mudsill at west end of short trestle, near southeast corner of sec. 20, T. 3 N., R. 1 E., 1 mile north of Felidia post-office; iron post marked "36"	36.339
Salmon Creek schoolhouse, in orchard, 2 feet from fence and 18 feet from fence corner, at southeast angle of crossroads, 160 feet from schoolhouse, in sec. 26, T. 3 N., R. 1 E.; iron post marked "194"	194.173
Salmon Creek bridge; head of nail in east end of cap of bent near south end bridge, ¾ mile south of Salmon Creek schoolhouse	82.3
St. John's church, ¾ mile west of; head of nail in root of fir tree 3 feet in diameter, at fence corner near forks of road	259.03
St. John's church; head of nail in root of partially decayed stump east of road and north of second-class road turning off to east through gate	260.368
Sections 29, 30, 31, and 32, T. 3 N., R. 2 E., corner of, in Mr. Curtin's yard, 150 feet from fence corner and 6.2 feet from fence, 4 feet east of walk and 116 feet from door of house, in northeast angle of forks of road; iron post marked "232"	231.753
Section 32, T. 3 N., R. 2 E., northeast corner of; head of nail in root of oak tree 14 inches in diameter, to north of road, and 100 feet south of crossroads	199.076

OREGON.

COOS COUNTY.

COOS BAY QUADRANGLE.

The elevations in this list are based on a copper plug set in a stone in the court-house yard at Empire City, which is a bench mark of the United States Coast and Geodetic Survey established in connection with tidal observations in the vicinity, and the height of which is accepted as 43.218 feet above mean sea level. The leveling was done under the general direction of Mr. E. C. Barnard, topographer, by Mr. C. C. Ward, levelman.

MYRTLE POINT, ALONG COOS BAY, ROSEBURG AND EASTERN RAILROAD, TO COQUILLE.

	Feet.
Myrtle Point, in north wall of Hermann & Brown's brick building, on corner of Spruce and Front streets, 30 feet from the northwest corner of building and 2 feet above the surface of the ground; bronze tablet marked "76"	75.916
Myrtle Point; top of iron ring socket, on edge of curb, near barber pole in front of Rose's saloon, in Hermann & Brown's building	73.891
Myrtle Point; top of iron ring socket, about 10 feet north of bench mark mentioned above	73.956
Coquille River, north fork of, 1 mile west of Mrytle Point; head of nail driven in top of pile brace, on left side of north end of trestle	24.3
A. H. Schroeder's house, 2 miles west of Myrtle Point; head of large spike driven into the gatepost, 1 foot above ground, 30 feet left of railroad, opposite house	30.4
Long Branch and Coquille City roads, junction of; head of nail driven in top of fence post, across railroad from large barn	27.6
Arago post-office; head of galvanized iron spike, in top of large fence post at northwest corner of J. F. Schroeder's orchard, 25 feet to right of center of railroad track	26
Trestle at sawmill; head of nail in root of cedar stump, north of wagon road and west of railroad, at road crossing, about 500 feet south of	20.616
Yokum's logging spur and creamery, halfway between; head of nail in top of myrtle stump 2½ feet in diameter, having a sawed face, 40 feet west of railroad track	19.5
Coquille City; head of nail in ledge of baseboard of the Tuttle Hotel, on cornice at right of door on entering building	40.2
Coquille City, at northeast corner of court-house site, in block 29, Ellicott's addition to Coquille City, 7 feet south of street line and 6 feet west of sidewalk; iron post marked "61"	60.936

COQUILLE, VIA FAIRVIEW AND GRAVELLY FORD, TO MYRTLE POINT.

County poor farm; head of nail in root of fir stump 36 inches in diameter, on right side of road, 150 feet east of forks of road	94.9
Bullock's ranch; head of nail in root of fir tree 42 inches in diameter, about 200 feet up road from bend	172.4
Coquille City and Fairview, summit of hill between; head of nail in root of fir tree at left edge of road	531
Marshfield, signboard to; head of nail in root of fir tree 30 inches in diameter and 125 feet beyond forks of road	373.7

	Feet.
Fairview schoolhouse; head of nail in butt of fir tree 8 inches in diameter, at bend of road, 95 feet from	138.5
Fairview post-office, in northeast angle of crossroads, sec. 25, T. 27 S., R. 12 W., 308 feet south of William Betty's house, 6 feet north of rail fence, and 49 feet to telegraph pole; iron post marked "134"	133.834
Coquille River, north fork of; head of nail in myrtle stump, on right bank of, 40 feet below bridge	110.6
Fairview and Lee post-office, summit of hill between; head of nail in butt of fir tree 12 inches in diameter, and 12 feet left of road	346.2
Lee post-office, 300 feet south of; head of nail in myrtle tree 10 feet north of wagon road	74.4
Lee Post-Office, in Mrs. Mast's dooryard, sec. 1, T. 28 S., R. 12 W., on south edge of walk from gate to house and 29 feet from house; iron post marked "89"	88.601
Lee Post-Office, bridge below; head of nail in myrtle stump having several branches, on right bank of the North Fork Coquille River, 50 feet downstream from bridge	76.2
Lee Post-Office, schoolhouse below; head of nail in butt of maple tree 18 inches in diameter, 25 feet to right of road and 200 feet down river from	65.5
Shuck's ranch; head of nail in butt of maple tree 34 inches in diameter, 10 feet to right of approach to bridge across Coquille River, near	59.1
W. Johnson's house; head of nail in dead myrtle stump 1 foot in diameter on bank of Coquille River, in front of	48.3
Gravelly Ford Post-Office; in northeast portion of yard, 3 feet each way from fence and 76 feet from the log house in which the post-office is located; iron post marked 62	62.014
Bald Hill, schoolhouse at foot of; head of nail in butt of alder tree 60 feet to right of schoolhouse	52.4
Bald Hill, summit of; head of nail in fir stump 20 inches in diameter, at forks of road 10 feet from main road, near summit	263.954
Llewellyn's ranch, on fork of Coquille River; head of nail in small myrtle stump on upper side of road, about 30 feet above gate	26.366

COQUILLE ALONG COOS BAY, ROSEBURG AND EASTERN RAILROAD TO MARSHFIELD.

Coquille City, 1¼ miles downstream from; head of nail in large alder 42 inches in diameter on bank of Coquille River, 40 feet from railroad	14.2
Coquille City, about 3 miles from; head of nail in top of cedar fence post 6 inches by 8 inches, 10 feet east of south end of railroad trestle	11.3
Beaver Hill Switch, 500 feet north of; head of nail in upper side of fir stump 4 feet in diameter, 30 feet east of railroad	16.8
Coaledo, 12.8 feet west of railroad, at a point 743 feet north of switch, where branch turns off to Beaver Hill, 3.5 feet east of section house and 5.8 feet north of the southeast corner; iron post marked "15"	14.868
Beaver Hill, 90 feet east and 50 feet north of the west end of the railroad trestle across the flat at Beaver Hill, in section 17, T. 27 S., R. 13 W.; iron post marked "10"	9.682
Beaver Hill Mine, in brick retaining wall at the rear of the boiler house; bronze tablet marked "66"	66.395
Coquille City and Marshfield, summit between; head of nail in fir stump 42 inches in diameter, about 400 feet north of railway crossing	71.5
James Wall's ranch; head of nail in fir stump 42 inches in diameter, at fence corner at upper side of wagon road, at railroad crossing, 1¼ miles below King's Landing	11.7

	Feet.
Isthmus Slough, 731 feet south of county road trestle, at James Wall's ranch, 24½ feet west of center of railroad, on section line between secs. 27 and 34, T. 26 S., R. 13 W., 40½ feet west of ¼ section corner and 87 feet east of county road where it crosses section line; iron post marked "10"	9.761
Southport Mill, 900 feet north of; head of nail in cedar stump 4 feet in diameter, and 10 feet to the left of railroad	13
Shingle House Slough, 800 feet south of; head of nail in fir stump, 4½ feet in diameter, on edge of cut on west side of railroad	10.4
Marshfield, south end of first long cut south of; head of nail in cedar stump 12 inches in diameter, 10 feet east of railroad and 175 feet north of water tank	18.3
Marshfield; nut of pump, across street from Blanco Hotel	7.6
Marshfield, in stone foundation of Merchant's Building, corner Front and B streets, on B-street side, 2 feet above cement sidewalk and 1½ feet from corner building; bronze tablet marked "11"	10.778
Marshfield; United States Coast and Geodetic Survey bench mark on window ledge at rear of S. D. Magnus's store	10.568

MARSHFIELD, VIA EMPIRE CITY, RANDOLPH, AND PARKERSBURG, TO ARAGO.

Empire City, cemetery east of; head of nail in butt of fir tree 36 inches in diameter, to left of road, 200 feet west of cedar tree marked "B. T., 1 mile," and about 50 feet east of trestle near cemetery	36.6
Empire City, bench mark of United States Coast and Geodetic Survey; copper plug in stone in court-house yard, 24 feet from corner of Broadway and G street, 1½ feet from line of G street	43.218
Empire City, in court-house yard, in front of building, and 20 feet from each street; iron post marked "44"	44.103
Pigeon Point, top of hill at; head of nail in root of swell butt of spruce tree 7 inches in diameter, on north side of road	44.5
Rocky Point, 3 miles south of Empire City; head of nail in butt of fir tree 1 foot in diameter, in forks of road	51.648
South Slough and Joe Ney's, summit of hill between; head of nail in cedar stump to right of road	139.1
Empire City, 5½ miles south of; head of nail in yellow cedar stump 26 inches in diameter, 8 feet right of road and about 100 feet east of forks of old road to Marshfield	101.6
South Slough bridge, east end of; head of nail in alder stump 8 inches in diameter, about 45 feet south of, near the foot of steep bank	6.9
Empire City, 8-mile post from, ½ mile west of; head of nail in cedar stump to left of road	372.4
South Slough, flat divide between two hills west of; head of nail in cedar stump 4 feet in diameter, to right of road, about 250 feet east of signboard at forks of road	360.7
Hinch's ranch; head of nail in cedar stump to right of road, between barn and cabin	551.8
South Slough and Pacific Ocean, summit between; 10 feet north of road, 43 feet from fir tree 12 inches in diameter with 4 blazes, and 52 feet to fir tree 18 inches in diameter with 4 blazes, both trees being south of road; iron post marked "573"	573.348
Fivemile Creek, ¼ of a mile south of crossing of; head of nail in butt of spruce stub 110 feet high and 3 feet in diameter, and 8 feet to right of road	135.7
Threemile Creek, Kendall's front yard; head of nail in burned fir stub 5 inches in diameter, about 100 feet from house	40.6

	Feet.
Twomile Creek; head of nail in spruce stub 3 feet in diameter, 10 feet east of road, 225 feet south of creek	31.3
Rose's house, 150 feet south of road turning off to; head of nail in yellow cedar tree 3 feet in diameter, and 8 feet east of road	186.1
Whisky Run, 60 feet south of; head of nail in root of fir stump 20 inches in diameter, 8 feet east of wagon road	156
Lane Mine, 10 feet north of branch road turning off to; 12 feet east of main road; the angle of roads is 90 feet south of trestle; iron post marked "160"	159.963
Campbell and Miller's ranch; head of nail in butt of cedar stump 14 inches in diameter, in forks of road, near signboard on stump	156
Randolph, top of hill near; head of nail in fir stump 3 feet in diameter, and 4 feet right of road	151
Parkersburg, about ¼ mile south of; head of nail in root of spruce tree 7 feet in diameter, 10 feet east of road, on east bank of Bear Creek, about ½ mile from mouth	7.7
Parkersburg, in brick foundation to the smokestack of the Parkersburg saw-mill; bronze tablet marked "34"	33.589
Bear Creek, bridge across, about 425 feet west of bridge on Bandon and Myrtle Point road; head of nail in alder tree 28 inches in diameter	15.1
Bill's Creek, about 400 feet above the mouth of; head of nail in maple stump 100 feet from left bank of Bear Creek	23.4
Randleman's Creek, 600 feet above mouth of; head of nail in maple tree 3 feet in diameter, on right bank of Bear Creek	33.5
Randleman's garden, on Randleman's Creek, which is the first branch on east side of Bear Creek, at corner of secs. 35 and 36, T. 28 S., R. 14 N., and secs. 1 and 2, T. 29 S., R. 14 W.; iron post marked "98"	97.735
Lamprey Creek Landing; head of nail in butt of spruce tree 5 inches in diameter, 15 feet from left bank of Coquille River, near new schoolhouse	7.6
Lamprey Creek, crossing of; head of nail in root of cedar stump 6 feet in diameter, 60 feet south of road, at creek crossing	28
J. A. Lyon's ranch, on township line between sec. 32, T. 28 S., R. 13 W., and sec. 5, T. 29 S., R. 13 W., 1½ feet south of fence marking township line and 99 feet east of wagon gate through the fence, 103 feet north of old house on ranch and about ¼ mile above road crossing of Lamprey Creek; iron post marked "35"	34.936
Lamprey Creek Hill; head of nail in root of myrtle stump 16 inches in diameter on first branch going east	118
Fish Trap Creek, bridge across; head of nail in top of pile above bridge.	25.1

CALIFORNIA.

ALAMEDA AND CONTRA COSTA COUNTIES.

MOUNT DIABLO QUADRANGLE.

The elevations in the following list are based on a bronze tablet placed in the foundation of the Hall of Records, Oakland, and marked "24." The height of this above mean sea level was determined by synchronous tidal observations, connecting the United States Coast and Geodetic Survey tidal gage at Sausalito with a tidal gage established by the Southern Pacific Company at Oakland. The tidal comparisons at Oakland were observed under direction of the chief engineer of the Southern Pacific Company. These comparisons were made on but three days, the 3d, 4th, and 5th of June, 1889, and the result obtained may be in error as much as half a foot, as estimated by the United States Coast and Geodetic Survey, by which organization the observations were reduced. A bench mark was established in connection with the Oakland tidal gage, and this bench mark was connected with the bronze tablet above referred to. Based on the above, the elevation of the central datum point is accepted as 24.143 feet above mean sea level. The leveling was done, under the general direction of Mr. L. C. Fletcher, topographer, by Mr. J. A. Vogelson, levelman.

OAKLAND POINT, VIA OAKLAND AND BERKELEY, TO WEST BERKELEY.

	Feet.
Oakland Point, Southern Pacific Company's bench mark; on top of a 30-foot bar of railroad iron driven in solid ground by means of a pile driver. The bench was afterwards covered by a wooden platform, with a hole bored through the planking so as to make it easy of access. This bench mark is located 30.5 feet from corner of machine shop and 19 feet from corner of office of the Southern Pacific Company, 1 foot from west edge of walk from railroad track to machine shops and 9 feet south from west side of doorway, and 0.4 foot underground	7.951
Oakland Point; tenpenny nail in sill of southeast corner of water tank at roundhouse	9.352
Oakland; hub at southeast corner of Atlantic and Pine streets	7.878
Oakland; tack in sill of crossing at east corner of Fifth and Peralta streets.	9.065
Oakland; hub 5 feet from edge of sidewalk at first gate west of market, on south side of Fifth street	14.136
Oakland; Broadway front of Hall of Records, in foundation on north side of entrance, 4 feet above ground; bronze tablet marked "24"	24.143
Oakland; hub at corner of curb edge of sidewalk, west corner Peralta and Sixteenth streets, opposite Chicago Market	8.227
Oakland; tenpenny wire nail 25 feet northeast of telephone pole B-73, which is first southwest of dog pound northwest side Peralta street	6.977
Oakland; wire nail in 4 by 4 post at turn in curb, northwest corner Thirty-second and Peralta streets	15.043
Oakland; cut in concrete stepping block southwest corner Park avenue and Hollis street, Randolett's house on same corner	19.89
Berkeley; tenpenny nail in back of old stump, northwest corner Park avenue and San Pablo avenue	40.745
Berkeley; tenpenny wire nail in front of 2-foot Lombardy poplar to north of first driveway to south of Parsons street, Golden Gate west side of street	35.823
Berkeley; hub at south of picket fence opposite barber shop near corner of Alcatraz and San Pablo avenues	40.352
Berkeley; tack in 4 by 4 post backing to curb, southwest corner San Pablo avenue and Grayson street, 7 feet from electric-light pole	46.659
Berkeley; hub at west side of Fourth street, 2 feet out from board walk and 200 feet south of Channing Way	29.169
West Berkeley; tack in 4 by 4 post at end of ditch under sidewalk at northwest corner of Fourth street and University avenue, opposite match factory	13.84
West Berkeley; hub near alarm bell	11.073

WEST BERKELEY, ALONG SOUTHERN PACIFIC RAILROAD, VIA SAN PABLO AND PORT COSTA, TO MARTINEZ.

	Feet.
West Berkeley Organ Works; hub between east siding and north-bound track, opposite "R" in red	7.622
West Berkeley station, ½ mile north of; tack in west end of cap of south bulkhead bridge 11-B	7.794
Fleming station crossing, hub west side of track 100 yards south of	8.745
Bridge 12–C; hub east side of track, 6 feet from rail and 205 feet south of bridge, opposite red house	5.875
Section post 20 and 21, hub 40 feet south of, between tracks	7.143
Bridge 13–B; tack in cap of north bulkhead, west end	9.634
Stege station; hub 75 feet north of head block, east siding	18.119
Stege station; eightpenny wire nail in south end of sill below step into waiting room	21.849
Stege station, ½ mile north of; hub between tracks, 75 feet north of second road crossing	24.753
Waterway 14–G, 40 feet south of; hub at east side of track	30.406
Cattle guard 16–D, north sleeper of; tack between tracks	34.198
Waterway 16–J; tack in west end of cap to north bulkhead of	30.966
San Pablo, 0.4 mile south of, 12 feet south of whistling post; hub west of tracks	28.307
San Pablo station; fortypenny handmade nail in base of 18-inch eucalyptus tree, north end of row in front of warehouse	25.398
San Pablo station; tack in east end of north sleeper of bridge 17-I, near water tank	25.725
Bridge 18–D, south end of; tack in cap between tracks	27.389
San Pablo, ¼ mile north of; tack in west end of cap to north bulkhead of bridge 18–H, 4.3 feet east of rail	24.276
Waterway 18–I, 100 feet north of; hub north side of track	20.379
Giant station, first whistling post south of; hub 34 feet north, north side of track	19.975
Sobrante; hub on north side of track in cut, 100 yards west of overhead bridge west of	28.197
Sobrante station; eightpenny wire nail in northwest corner of platform, 2¼ inches out from buildings and 4 inches from edge of platform	20.91
Sobrante, ¾ mile east of; tack in end of 10 by 10 diagonal, south end of east bulkhead of bridge 21-N	7.447
Pinole station; hub between tracks, west end of second cut west of	8.775
Pinole; fortypenny nail in root of 2-foot eucalyptus tree at southwest corner of station	8.612
Curve stake No. 41; hub 6 feet west of, on north side of track	7.986
Hercules station (24–E), first bridge east of; tack in end of 12 by 12 diagonal piece at south end of east bulkhead	7.996
Rodeo; copper bolt in sandstone face of railroad cut 180 feet west of station, south side of track, marked "U.S.G.S. B.M."	12.465
Rodeo, ¾ mile east of; tack in end of diagonal 12 by 12 at east end of north bulkhead bridge 27-A	8.09
Union Oil Works, tack in gasket at exposed joint of water pipe leading to; north side of track	8.328
Waterway 27-C; kingbolt north end of west bulkhead, 4.8 feet north of rail, in diagonal brace	8.661
Selby Smelter; tack in eye to ringbolt in west end of 12 by 12 sill to platform around moving truck for sidings	9.083
Port Costa Lumber Company's sign, hub 12 feet west of; hub block opposite	7.705
Crockett; tack in sleeper at end of uncovered dock east of agricultural dock	8.136

	Feet.
Granger's warehouse; hub at side of telegraph pole opposite door No. 7	8.265
Port Costa; spike on south side of water feeder, 200 yards west of station	9.542
Port Costa, in middle of concrete column of Karquines Market Building on Main street, near depot, opposite Burlington Hotel; bronze tablet marked "17"	16.587
Port Costa; nail in root of two-foot eucalyptus tree, foot of Main street	8.833
White ash coal bunkers; hub 0.015 foot out from trespasser's notice, 200 yards west of bunkers	8.855
Nevada Dock No. 1; kingbolt north end of cap of east bulkhead of bridge 33–A, in front of door No. 19 of dock, and 4 feet from rail	7.168
Martinez, 1½ miles west of; driftbolt, north end of west bulkhead of bridge 34–A	9.092
Martinez; tack in north end of cap to west bulkhead, drawbridge 35–E	7.616
Martinez; hub between main and side tracks, 38 feet west of tank Martinez	6.223
Martinez; United States Coast and Geodetic Survey bench mark; copper bolt set in brick front wall of the county building between the windows of the county clerk's and the auditor's offices. Bolt is marked on the face with the letters "U.S.C.G." cut into angles of a cross. The elevation of this bench mark is given by the U. S. Coast and Geodetic Survey above half-tide level at Army Point, near Benicia, as 27.09 feet	26.886
Martinez court-house, United States Geological Survey bench mark at same place; bronze tablet marked "27"	26.882

MARTINEZ, VIA PACHECO, TO CONCORD.

	Feet.
Martinez, first house out from; hub on outside edge of path at end of picket fence	69.729
One-mile post; hub north side of road, next to fence opposite, 20 feet east of block 22 by 20	100.016
Block 35 by 37; hub on north side of road at bend of road near, 15 feet west of first telegraph pole west of block and ½ foot north of fence	25.852
Northeast corner of school-yard fence; hub on south side of road, ½ foot out from fence, and seventh post from northeast corner of	20.401
Mosquito Bend; tack in sidepiece in north end of new culvert opposite block 65 by 67	11.075
Four-mile post; hub north side of road, 6 feet north of first telephone pole south of, near forks of road, 1 foot out from fence	40.491
Pacheco; United States Coast and Geodetic Survey bench mark; iron piece projecting from wall of brick building, formerly a warehouse with iron shutters, owned by G. Anderson, third building north of road to Concord, and opposite post-office	21.033
Pacheco; United States Geological Survey bench mark, 0.075 foot south of United States Coast and Geodetic Survey bench mark; bronze tablet stamped "21"	21.02
Pacheco, bridge ⅛ mile east of; tack in southeast corner of, in bulkhead facing	19.824
Pacheco, one-half mile east of; tack in 4 by 6 post to left of embankment, 16 paces from west end of long bridge	21.09
Concord railroad station; top of rail at road crossing	41.796
Concord railroad station; two tacks in southeast corner of sill frame around platform scale, near door of Anderson & Co.'s office	43.391
Concord; wire nail in root of large oak in middle of steet, between blacksmith shop and fruit store	60.14

CONCORD, VIA CORNWALL, TO BLACK DIAMOND.

	Feet.
Concord, west corner of public square, southeast intersection of main street with street running by Kline's hotel; iron post marked "65"	64.461
Concord, 2 miles from; nail in foot of 2-foot cottonwood tree at angle of road opposite house, about 300 feet from a right-angle turn in road to east, east side of road south of fence	33.381
Hillman's house; tack in east end box culvert just north of	19.391
Bay Point, ¾ mile south of; hub, west side, 9 feet from sixth fence post north of angle in road near old warehouse	12.43
Bay Point, ½ mile from; peg 2 feet north of first post north of old gate post post in fence running toward station, near gate to private road	21.96
Bay point, Blum's warehouse; top of rail at road crossing to Seal Bluff	6.752
Cattle guard 41-B; tack in south end of east sleeper	6.734
Blum's warehouse, 0.4 mile from; hub at east end of old platform east of corral, eucalyptus grove 0.3 mile to southeast	6.5
Bridge 42-H; tack in northeast corner of trestle	6.84
Blum's warehouse, 1¼ miles from; tack in sleeper of cattle guard and bridge on section line; fence marked 43-B, near beginning of long tangent	4.858
Bridge 43-D; tack in sleeper south side east end, 2.6 feet from end	5.528
Cattle guard 44–A; tack in sleeper, south side, east end	12.999
Cattle guard 44–E; tack in south end of sleeper, west side	8.181
Cattle guard 45–C; tack in south end of sleeper, west side	10.807
McAvoy's siding; middle of west end of warehouse; hub and tack	18.823
McAvoy's siding, in corner of fence southwest from southwest corner of warehouse; iron pipe stamped "22"	22.289
McAvoy's, ¼ mile east of; tack in south end of sleeper at west end of bridge 46–A	11.079
Cattle guard 46–F; tack in southwest corner of	12.325
Cattle guard 46–L; tack in southwest corner of	13.278
Bridge 47–C; tack in south end of third sleeper from west end, 1.5 feet from end of sleeper	12.934
Cattle guard 47–E; tack in southeast corner of	17.442
Bridge 47–G; tack in south end of sleeper at west end of; red windmill on edge of swamp, 500 feet north of, at end of long tangent east of McAvoy	19.124
Bridge 48–B; tack in south end of sleeper, at west end; bridge is about 200 yards west of county road crossing, about 2 miles from Cornwall	17.366
Bridge 48–H; tack in south end of sleeper at east end; bridge is on tangent, about ¼ mile west of water tank near Cornwall station	15.811
Cornwall station; tack in sill at east end of trestle across Southern Pacific tracks, second bent north of tracks; sill about 2 inches below surface of ground	26.691
Black Diamond, at corner of stable; iron post marked "21"	20.379
Black Diamond Hotel; tack on porch of, midway between two doors, 4 inches from side of house. (The above bench mark is, as nearly as could be determined, the datum of the level system of the State engineering department, the elevation of which above the mean "lowest low tide," as resulting from tidal observations made at New York landing during the months of October, November, and December, 1878, is 11.22 feet. By the United States Geological Survey levels the elevation of this bench mark above "lower low water" at Sausalito is 10.329 feet.)	7.379

CORNWALL TO ANTIOCH.

One-half mile east of Cornwall; tack in south end of sleeper at east end of bridge 50–B; 3-foot oak in arroyo 75 feet a little west of north, from bridge	29.694

	Feet.
Bridge 50-E; tack in south end of sleeper at east end, 6 feet from white section post, marked "28 and 27"	34.483
Pittsburg Railroad overhead trestle; tack in bent between Southern Pacific tracks	39.532
Antioch Station, about 2 miles from; tack in south end of sleeper at east end of bridge 52-B; house on east bank of arroyo, about 200 yards northeast	41.158
Cattle guard 53-C; tack in south end of sleeper on west end of, on east side of county road crossing	41.333
Bridge 53-F; tack 2.4 feet from north end of sleeper at west end of, about ⅛ mile west of Stuartsville coal railroad trestle	36.744
Stuartsville Railroad trestle; hub 2.4 feet north of north rail of side track, 25 feet east of stairway on north side of cut at trestle S. P. 54-A	39.538
Antioch schoolhouse, in rear wall of foundation; bronze tablet marked "35"	35.196

ANTIOCH TO BRENTWOOD.

Antioch Station; in front of	43.415
Antioch Station, ¼ mile east of; hub on north side of mail block	42.656
Antioch, 1½ miles east of; tack in north end of west sleeper at cattle guard 55-D	51.374
Bridge 56-A, tack in north end of sleeper at west end of	55.865
Bridge 55-C; iron bolt driven in ground, 0.6 of a foot south of whistling post near private road crossing, about ¼ of a mile from east end of long tangent from Antioch	63.547
Walling's house; pine hub on north side of track, 30 feet from road crossing in front of house	68.187
Bridge 57-B; tack in sleeper north end of fourth bent, counting from the west	70.712
Neroly siding, county road just north of; gate to private road crossing, first panel east of gate; iron post marked "79"	78.823
Trestle 58-A, tack on	77.209
Brentwood, about 3 miles north of; tack in west end of sleeper at south end of bridge 59-A	92.443
Robert Cakebread's lot pine hub inside of; 50 feet from, where railroad crosses county road, about 2½ miles north of Brentwood	93.382
Brentwood, west of track at north end of platform, across tracks from store; iron post marked "77"	76.79

BRENTWOOD VIA MARSH CREEK TO MORGAN TERRITORY.

Brentwood, ½ mile north of; pine hub on side of road 100 feet south of switch	71.459
Brentwood, ½ mile west of; road to Marsh Creek; railroad spike opposite forks of road, 1.3 feet south of second post on fence	75.205
Brentwood, first ranch house south of east and west road from; hub at corner of fence by chicken house; lombardy poplar just inside of fence.	93.46
Marsh Creek bridge; east approach, north side, tack on east pile of three.	199.362
Collis's house, 100 yards north of, on west side of road; wire nail in root of oak tree 4 feet in diameter	207.681
Collis's house, at corner of gate to pasture in front of; pine hub with tack.	210.507
Cakebread's ranch, on north side of Marsh Creek, about ⅙ of a mile from bridge, 6½ panels from corner of fence around; letter box at corner; pine hub with tack	212.1
Martin's winery, near road to; pine hub opposite corner of fence	257.921

	Feet.
Marsh Creek bridge near Satterlee's house; second inside bolt north side east approach	293.915
Antioch and Brentwood roads, junction of; nail in base of white oak tree in field north and east of junction	329.993
Paulucci's house, 1½ miles from; pine hub at bend of road	366.572
Paulucci's house; wire nail in root of cottonwood tree used as gate through pasture	398.883
Cordoza's house, 200 yards west of; hub at base of sycamore tree	535.532
Road turns to right; pine hub opposite sycamore tree near a live-oak tree and rocks; rocks marked	554.577
Clayton, about 7 miles east of; 130 feet north of old house opposite barn east of road and 30 feet from bank of creek; wire nail in root of 2-foot white-oak tree, where Marsh Creek first runs in near road from Morgan territory	607.974
Morgan territory, 0.3 mile east of road to; on side of grade 50 feet below large oak; pine hub	736.6
Morgan territory; in schoolhouse yard, 55 feet east of northeast corner of schoolhouse; iron post stamped "766"	765.705

MORGAN TERRITORY, VIA CLAYTON, TO CONCORD.

Ferguson's gate, bridge near; tack and hub 130 feet uphill from, opposite large oak	736.5
Marsh Creek and Clayton; divide between, 100 yards north of summit; wire nail in root of 2½-foot oak tree east of road	947.975
Marsh Creek and Mount Diablo Creek; divide between, just east of gate; iron post marked "955"	954.969
First house north of summit; wire nail in root of 3-foot oak 100 yards above	761.099
Clayton, 1¾ miles from; tack in northeast bulkhead post of culvert; road between vineyards	583.707
Perry's winery, about 1½ miles from Clayton and 100 yards beyond lane to; pine hub near gate east of road	536.117
Clayton, intersection of Nortonville and Marsh Creek roads with main street, near guidepost; iron post marked "395"	395.005
Clayton, top of hill west of, about 50 feet east of fence and 8 feet from fence line; pine hub	430.782
Atkinson's house, on road through gate to; pine hub at corner of fence	372.8
Kirkwood's gate, about 160 yards north; wire nail in root of first oak tree, west side of road	340.844
Clayton, about 2½ miles northwest of; pine hub opposite locust tree, 140 yards from road to south, near windmill	271.8
Busby's house, road to; pine hub and tack on left of, at corner of fence	214.088
Concord, about 2 miles southeast of; tack on top of south end of culvert post; row of eucalyptus trees north and east side of road	168.476
Concord, about 1½ miles southeast of; hub at corner of fence at junction with road going north	127.8
Concord; west corner of public square east of intersection of main street with street running by Klein's hotel; iron post marked "65"	64.461

MARSH CREEK, VIA VASCOE SCHOOLHOUSE, LIVERMORE, AND TASSAJARA VALLEY, TO COUNTY LINE.

Collis's house; 4-foot oak tree 100 yards north, west side of road; wire nail in root	207.681
Marsh Creek, 1½ miles south of; pine hub at intersection of roads	255.8
Frank Rufet's house; pine hub on west bank at bridge south of	253.465

	Feet.
Kellogg Creek, bridge across; 5-foot oak 250 yards north of and 50 feet inside field east of road; nail in foot	289.889
Kellogg Creek, bridge across; on west side of, 1 mile from Frank Rufet's house; tack in pine hub	289.85
Kellogg Creek, bridge across; wire nail in sleeper of, 10 inches from preceding mark	290.369
Silva's house; at corner of corral around three large oaks near; tack in pine hub	347.2
Vascoe schoolhouse, ⅛ of a mile north of, on hillside opposite flat rock; tack in pine hub	385.718
Vascoe schoolhouse; wire nail at foot of post, near common nail, at northwest corner of	398.031
Vascoe schoolhouse; opposite, on west side of road; iron post marked "401"	401.277
Black Hills Creek, bridge across, near northwest end of; tack in pine hub in corner of fence	506.2
Sections 4, 5, 32, and 33, corner of (check); ⅙ of a mile northeast of corner of bridge; wire nail in root of white oak tree	573.1
Serpe's house; pine hub opposite; blazed post above	853.8
Vascoe divide; east side of road; iron post marked "970"	969.667
Romane's house; pine hub corner of fence above	917.7
Munch's house; south and west of stone bridge on second road to; tack in pine hub near	783.6
Munch's house; about 400 yards south of last bench mark; top of middle rock of four rocks west of road	732.63
Christiansen's house; embedded rock in forks of road north of	673.142
Barry's house, near; at foot of hill in front of fence post, five panels from corner; nail in pine hub	551.6
Stockton road; pine hub on line with fence running west, near second house on right from; not checked on	524.8
May's house, ¼ of a mile from; 12 panels south of fence corner, tack in pine hub	524.513
Livermore, ⅛ mile from; pine hub near bars on south side of road, 100 yards from windmill	518.2
Livermore, Farmers' Union Building; southeast corner of block north of Southern Pacific tracks; bronze tablet, marked "488"	487.393
Livermore; northeast corner water tank near depot; on head of bolt at foot of iron post on side of tank next to depot	481.133
Livermore; top of rail, main track in front of depot	482
Livermore; brown house near forks of road entering Livermore from west; pine hub opposite corner of white fence around	463.73
Rampkin's gate (white); tack in wooden hub east side	416.842
Rampkin's gate, 200 yards east of; tack in bridge floor, south side, 7 paces from end	411.379
Livermore, 3 miles from; opposite road running north to the hills; tack in hub two panels west of gate	414.38
George Croop's house; wire nail in near side strut of bridge opposite	386.16
Kelly's gate, tack in top of post on right of	350.801
Kelly's gate, 100 yards east; tack in west approach, south end of culvert	347.403
Tassajara, junction with road to; at northwest corner, iron post marked "346"	345.777
Tassajara Valley, about 2½ miles north of main road, on west side of Tassajara road and 2.2 feet east of monument on county line between Contra Costa and Alameda counties; iron post marked "485"	484.96

TASSAJARA VALLEY, VIA DUBLIN, TO DANVILLE.

	Feet.
Schabot's ranch, near; tack in west side of water tank, north of road and west of ranch	325.17
Dublin, 1 mile east of Y road; tack in east sill of water tank	330.126
Dublin, intersection of center line of San Ramon road and south line of main road; iron post marked "367"	366.517
Dublin, first hill north of; tack in hub on right of road, 8 feet from blazed fence post at top of hill	380.063
Contra Costa and Alameda counties, boundary line; 2.3 feet west of county line monument, on east side of road, iron post marked "425"	424.67
Glass's house, tack in top of third post from north end of hitching rail in front of	427.349
Mrs. Hardin's house, tack in top of bulkhead post in southwest corner of bridge south of	422.441
Mrs. Hardin's house, first house north of; tack in 6 by 8 brace to gatepost on left of	451.951
San Ramon and Amador valleys, divide between	498.787
San Ramon, tack in pine hub in corner of fence on road to warehouse diagonally opposite from saloon	486.398
San Ramon Creek, bridge across	485.334
San Ramon, ¼ mile north of; nail in root of eucalyptus tree on east of road, tree on east side of fence, root on west side	469.743
Road going east; pine hub opposite corner near eucalyptus tree	466.4
Labrey's white house; pine hub at corner of fence near road to Meece's house	439.6
San Ramon Valley Nursery; tack in root of locust tree on west side of and 29 paces from division fence	419 558
Danville, ⅜ of a mile south of; tack in 6 by 4 post south and west end of culvert where road turns north into Danville	402.908
Danville; railroad track south of depot	370.4
Danville; tack in 6 by 12 sleeper at railroad depot, southeast corner	368.08
Danville, in brick foundation of schoolhouse; bronze tablet marked "365"	364.395

DANVILLE TO WALNUT CREEK.

Hemmes's picket fence, bridge nearly southwest of; tack in northeast bulkhead post at approach to bridge	326.75
Alamo, east side of Main street, and north side of lane to Railroad ranch, opposite hotel and post-office; iron post marked "270"	270.177
Alamo, about ⅞ mile from; tack in northwest corner of box culvert	233.787
Fold's house, flat-headed wire nail in root of large oak on bank of creek, in front of	174.24
Walnut Creek, in schoolhouse yard, between eucalyptus trees, near east fence; iron post marked "151"	150.599

WALNUT CREEK TO PACHECO.

Catholic church and old gate; tack in pine hub, near stump inside of fence between	144.77
Larkey's side road; pine hub with tack at foot of third eucalyptus tree from telegraph pole north of	104.47
Hookston station; tack in pine hub about halfway between telegraph post and railway guide, opposite cypress tree	61.2
Pacheco, about ¾ mile from, 200 feet beyond bridge, opposite two oak trees; pine hub with tack	21.9
Pacheco; Coast Survey Bench Mark	21.03

SOLANO AND NAPA COUNTIES.

KARQUINEZ QUADRANGLE.

The elevations in the following list are based on a bronze tablet in east face of southeast corner of the foundation of the public schoolhouse at Benicia, marked "35." The elevation of this bronze tablet was obtained by reference to a United States Coast and Geodetic Survey bench mark, described as the upper surface of a ⅝-inch iron bolt driven in a hole drilled horizontally in the southwestern face of a sandstone rock at the top of a ledge near high-water mark at Benicia Arsenal, just south of the railroad and east of the arsenal wharf. The elevations are referred to mean bay level at Benicia, which probably varies from mean sea level by a few tenths of a foot. It was expected that the difference would be accurately known from the results of a precise line of levels run by the United States Coast and Geodetic Survey between the tidal staffs at Benicia and Sausalito, but the information has not been obtained in time for publication. Based on the above data, the elevation of the central datum point is accepted as 34.548 feet. The leveling was done under the direction of Mr. L. C. Fletcher, topographer, by Mr. J. A. Vogelson, levelman.

BENICIA, VIA VALLEJO, NAPA JUNCTION, AND CORDELIA, RETURNING TO BENICIA.

	Feet.
Benicia Arsenal; on brass cannon with muzzle down, used as a guard post at arsenal gate, marked "58"	57.948
Benicia, on iron eye carrying ring to concrete hitching block on north side of Vallejo road, in front of new frame house in second block east of main street; iron fence in front of house, and a house with two bay windows on opposite side of street	54.874
Benicia schoolhouse, in southeast corner of foundation, east face, 2⅛ feet above ground; bronze tablet marked "35"	34.548
Bend in road, where straight road from Benicia comes down to water front; pine hub at south of fence 30 feet west of telegraph pole, with 6 by 6 post holding wire guy	17.55
Vallejo and Sulphur Springs road, intersection of, 3 miles west of Benicia, near corner of fence around Miller's ranch; iron post marked "27 feet"	27.431
Slough, bridge across, tack in east end of south sill of, just before reaching hill	7.529
St. Vincent's Cemetery; pine hub 5 feet from fence north side of road, and about 125 feet west of gate to	179.384
Vallejo, one mile from, at forks of road to North and South Vallejo, pine hub near south fence, and 62 feet from fence corner	62.014
Vallejo, one block north of depot; tack in east end of south sleeper of cattle guard 68-B, 1 block south of overhead bridge, county road to	20.171
Vallejo, Sacramento street side of Bernard House, east of entrance, and 4 feet above sidewalk; bronze tablet marked "44"	43.77
Vallejo; tack in east end of south sleeper of cattle guard 67-I, Vallejo yard north limit	19.89
Asylum, crossing to; tack in east end of south sleeper cattle guard 67-B	19.692
Vallejo, cemetery north of; tack in east end of south sleeper of cattle guard 66-G, north side of road crossing east from cemetery	21.967
Cattle guard 66-A; tack in east end north sleeper	17.169

	Feet.
Three-Mile House; tack in east end of north sleeper cattle guard 65–B at railroad crossing in front of	24.979
Cattle guard 65–B; tack in east end north sleeper	33.43
American Canyon; tack in east end of north sleeper of bridge 64–C, across creek from	36.223
Napa Junction, ½ mile south of; tack in east end of south sleeper cattle guard 63–C, private road crossing; large house with red roof, cupola, and flagstaff, ¼ of a mile distant	64.005
Napa Junction; knob in concrete block at base of semaphore	74.164
Napa Junction, across tracks from hotel, near fence, on line between corral and section house, near gate leading to county road; iron post marked "70"	69.792
Napa Junction, ½ mile north of; tack in west end of north sleeper of cattle guard 61–F	97.763
Napa Junction, 1 mile north of; tack in east end of south sleeper bridge 61–A, orchard to east and white house 200 yards southeast	127.606
Napa Junction, 2 miles north of; tack in west end of south sleeper of new trestle 6 bents long	184.624
Napa Junction, end of second tangent from; plug 11 feet north of track and 100 feet east of gate and field crossing	208.218
Creston; sharp point of rocks on south side of track 1.5 feet from fence and 3.8 feet from lombardy poplar back of station, and about 200 yards east of tank house	300.636
Creston station, on main east-and-west road north of railroad, on south side just east of northeast fence corner; iron post marked "306"	306.122
Creston, 1¼ miles east of; tack in south end east sleeper of bridge 57–G, barn and corrals just west of bridge	237.913
Bridge 56–C; tack in 2½ by 5 inch vertical piece at south end of west bulkhead, 2.6 feet from track	153.937
Cordelia, 1 mile west of; tack in south end of west sleeper of cattle guard 55-D at road crossing; bridge is 50 yards southwest on county road; road forks 200 yards east	91.275
Cordelia, west end of, at junction of Benicia and Napa roads; hub 1 foot from fence, 15 feet west of northwest corner	28.079
Cordelia, intersection of main street with road to Benicia, north of railroad, on south line of main street near western side of Benicia road; iron post stamped "29 feet"	28.591
Cordelia, bridge 0.04 mile from railroad station; tack in first post from bridge, on west wing of south bulkhead of	33.389
Cordelia, about 1 mile south of railroad at; hub on east side of road to Benicia, at side of fence nearest patent gate painted red, 300 yards beyond old barn	33.413
Cordelia, 1½ miles from; tack in first 12 by 12 pile on west side of east end of truss bridge, unpainted house in clump of trees on edge of swamp about ½ mile east, near first bend on road south of railroad	31.825
Cook's ranch; tack in middle pile of facing at small bridge at turn of road, about 3 miles south of Cordelia	21.281
Cook's ranch, east side of road, just north of bridge; iron post stamped "21"	20.552
Teal station, gate about opposite, about 200 feet south of gate to ranch, ranch about ½ mile west of county road; hub near east fence	8.418
Brien's house; hub on east side of road near rock by fence, 300 yards south of; stone fence on point of hill 100 yards south and 50 feet east of point where slough makes nearest approach to fence	5.785
Goodyear station, schoolhouse 1½ miles north of; nail in base of live-oak in front of	16.59

	Feet.
Goodyear station, schoolhouse 1½ miles north of, on west side of road south of stile; iron post marked "17"	17.277
Goodyear station, 1 mile north of; hub 2 feet east from east fence, 5.6 feet south of telegraph pole on crest of small ridge, 100 yards north of new barn	16.806
Goodyear station; hub at corner of fence just north of section house	7.006
Bridge 37–C; tack in facing west bulkhead	7.175
Waterway 37–A; tack in south end sleeper	5.981
Army Point, long trestle across slough north of; tack in vertical piece 2½ by 6 feet at facing of bulkhead, east end of trestle 36–B, north side of track	8.138

CORDELIA, VIA FAIRFIELD, TO POTRERO HILLS.

Cordelia; tack in north end of east sleeper of cattle guard 55–A, west end of	28.451
Cordelia, opposite little red saloon; tack in end of 12 by 12 upright, north end of east bulkhead of waterway at west end of siding	15.712
Tunnel, Stone Quarry Hill; hub between rails, 12 feet west of portal to	17.449
Bridge 52–C; tack in 2½ by 8 upright, north end of east bulkhead	19.946
Suisun, about 2 miles from; tack in north end of east sleeper cattle guard 51–A, first road crossing east of Cordelia	22.261
Suisun, 1 mile to; tack in top of sloping 6 by 6 beam at north end of east bulkhead, bridge 50–E	15.388
Fairfield; tack in 4 by 6 post east side of board walk at street intersection, three blocks south of court-house	7.304
Fairfield court-house, 7½ feet below bottom of stone ledge to first window of auditor's office, left of main entrance; bronze tablet marked "15"	15.151
Fairfield, 1 mile east of; hub at south of fence north of road, 19 paces west of blazed telegraph pole	6.264
Suisun, 3 miles east of; hub south side of road, opposite first telegraph pole west of road to north, 2.8 feet from fence and 150 feet from fence running south	13.51
Suisun, 3 miles east of road intersection at corner of secs. 28, 29, 32, and 33, T. 5 N., R. 1 W., 35 feet north of culvert, on east side of road, first road to north after leaving Fairfield; iron post marked "15"	14.786
Potrero Hills, on section line between secs. 3 and 4, ½ mile south of north line of section, opposite gate to Sylvester Pimental's ranch, and 5½ miles east of Suisun; iron post marked "49"	49.045

CORDELIA TO NIGHTINGALE'S HOUSE.

Cordelia, 1 mile from, at bridge across Green Valley Creek; tack in east guard rail, 3 feet north of center	16.674
Green Valley, Nightingale's stone house; hub on west of road near northwest corner of fence at intersection of road to west, near	38.207
Cordelia, Nightingale's stone house, Green Valley, at northwest corner of road, 3 miles from; iron post marked "39"	39.021

NAPA JUNCTION TO THOMPSON STATION.

Bridge 62–G; tack in west end of diagonal piece south bulkhead	67.972
Waterway 63–C; hub 1½ feet east of fence post at east end of	43.561
Bridge 64–C; tack in 4 by 6 upright west end south bulkhead	67.334
Trestle 65–B; tack in 12 by 12 diagonal west end of north bulkhead	67.22
Thompson Station; hub near blazed post 8 feet east of pine tree and 25 feet southeast of switch block, south end of siding	8.405
Thompson Station, east of railroad, south end of switch, near switch block; iron post marked "9"	8.822

THREE-MILE HOUSE TO LAKE CHABOT.

	Feet.
Lake Chabot; knob on north wall of spillway 1.7 feet east of vertical backing for gate	84.807
Bottom of spillway	77.7
Lake Chabot, about ¼ mile east of, on Sulphur Springs road, 2½ miles east of Three-Mile House, at bend of road between American Canyon road and Cut-Off road to Vallejo, at southwest corner of right angle turn in road; iron post marked "114"	113.528

SAN JOAQUIN, STANISLAUS, CALAVERAS, TUOLUMNE, AND MONO COUNTIES.

JACKSON, SONORA, BIG TREES, AND DARDANELLES QUADRANGLES.

The elevations in the following list are based on a bronze tablet in San Joaquin County court-house in Stockton, and marked "18." The initial height upon which this elevation depends is obtained from the United States Coast and Geodetic Survey tidal gage at Sausalito by synchronous tidal observations to a tidal staff at Oakland; then through a bench mark determined by the Southern Pacific Company in connection with the tidal staff above mentioned to a bench mark established by the State engineering department on the porch of the hotel at Black Diamond, or New York Landing. The line from Oakland to Black Diamond was run by the United States Geological Survey. From the Black Diamond bench mark a line of levels was run, under the direction of Mr. J. R. Price, chief engineer of the Board of Public Works, to a bench mark at Stockton, known as the Cool Corner bench mark. This is the initial point upon which depends the elevation of the central datum point for this region, and as gotten from it the elevation of the latter above mean sea level is 17.461 feet.

The weak point in the above connection is the determination of the relative elevations of the tidal staffs at Sausalito and Oakland. Later it will be possible to establish a more accurate reduction to sea level, as the Coast Survey is having run a line of precise levels from the Sausalito gage to its Benicia gage, the latter being carefully connected at Martinez with the main line of levels from Oakland to New York Landing. The leveling here listed was by means of duplicate rods, and was done by Mr. J. B. Lippincott, levelman.

STOCKTON.

	Feet.
Stockton, on southwest corner of Scott avenue (south side of Mormon Channel) and Center street; on north iron doorsill, west end of Cool Corner saloon	15.141
Stockton, on southwest corner of Scott avenue and Center street, 18 feet from curb corner and 12 feet north of iron doorsill; iron post marked "16"	15.481
Stockton Channel, at southeast head of; corner of Weber avenue and Eldorado street, east of steps at the corner post, on iron plate	12.222
Stockton; on the top of a stone post on the north side of the court-house and west side of walk	15.6

	Feet.
Stockton, San Joaquin County court-house; in the angle of wall at north entrance, west of the door and near columns, between the north door and the first window west of it; bronze tablet marked "18"	17.461
Stockton, Southern Pacific passenger depot; top of rail at crossing Milton and Oakland branch	18.273

STOCKTON, ALONG MILTON ROAD AND SOUTHERN PACIFIC RAILROAD, TO WAVERLY.

Stockton; junction of East Sonora street and Marsh's lane; nail in root of 3½-foot oak, 260 feet south of road	23.139
Stockton court-house, 3 miles east of, at lane to Marsh's house; in root of large eucalyptus tree, on the north side of the road	31.607
J. B. Marsh's house, at the northeast corner of the entrance of the lane to; iron post marked "34"	33.113
Stockton, about 5 miles east of; bolt in the sill of a public tank	39.706
Stockton-Milton road; at angle of road, under an undertaker's sign, on nail on post on the north side of road	52.452
Collegeville road, crossing of; near the Chartwell schoolhouse, on peg outside the fence	59.921
Farmington, junction with the road to; near Smyth's ranch, on nail in end post in end of V inside of fence	65.044
Farmington, junction with the road to, 10 feet north of preceding bench mark; iron post marked "67"	66.059
Railroad crossing; head of carriage bolt driven in the crossing sign on the south face 2 feet above the ground, marked "B.M."	72.841
Peters, about 2 miles west from; spike in the north end in the east cap of bridge	86.37
Peters, 1½ miles west of; approximately 75 feet east of small bridge on the east post of gate, on west side of road	87.597
Peters station, about ½ of a mile north of; at southeast corner, junction with Peters-Linden road; spike in telephone pole	99.741
Peters-Linden road, junction with, at southeast corner of; iron post marked "102"	101.333
Peters, first railroad-crossing sign east of, on the south side of the track; station 528–15, railway measurement; spike in crossing sign	139.145
Fairview farm; station 456–62, railway measurement; spike in crossing south side of track	164.389
Milton, about 6½ miles west of; railroad bridge No. 112–B, on the northeast corner of the bulkhead cap of	164.401
Waverly; railroad spike on crossing sign of the wagon road at	216.6
Waverly, at the crossing of the Stockton-Milton road over the Southern Pacific tracks, on the south side of the track and east side of the crossing sign; iron post marked "219"	217.793
Waverly; top of rail at	214.739

WAVERLY TO MILTON.

Waverly, ½ mile east of; spike in whistling post	234.194
Milton, 4 miles west of; at drain tile marked "116–B," on top of post, north side of track	270.411
Milton, 2 miles west of; crossing of Stockton-Milton road; spike in crossing sign 119–40, railway measurement	349.231
Milton, ¼ mile west of; 8 feet north of the track, on top of 2 by 4 post, marked "121-B"	378.573
Milton; Southern Pacific depot, on cast-iron corner of rail guard of walk or platform 19.8 feet northwest of the northwest corner of depot building	380.595

	Feet.
Milton, 9 feet north of southeast corner ot Peterson & Drake's warehouse and 57 feet south of the railroad track, 60 feet west of the Southern Pacific passenger depot, and 60 feet southwest from preceding bench mark; iron post marked "383"	381.838

MILTON, VIA COPPEROPOLIS AND O'BYRNES FERRY, TO JAMESTOWN.

	Feet.
Pieper's field, 500 feet west of the house; nail in notch in root of 4-foot oak tree 200 feet south of the road	263.337
Milton, 2¾ miles east of, ½ of a mile west of Schroebel's house, on north side of road; nail in notch in root of 30-inch white-oak tree, blazed and marked "U.S.G.S. B.M. 414"	413.103
Schroebel's house, at top of grade ½ mile northeast of, 100 feet north of road; in root of 40-inch white-oak tree, blazed and marked "U.S.G.S. B.M 572"	570.862
Black's grade, south side of road, 2¼ miles west of reservoir and ½ mile west of old houses and fig trees; in root of white-oak tree, blazed and marked "U.S.G.S. B.M. 727"	725.87
Reservoir, 1 mile west of, 20 feet south of, 200 feet west of the crossing of the canal, and 1,500 feet west of summit; nail in notch in root of white-oak tree, blazed and marked "U.S.G.S. B.M. 1025;" large rocks on the north side of the road	1,024.033
Salt Springs Valley Dam, 300 feet west of, at the south end of and 300 feet east of house; nail in notch in root of white-oak tree, 50 feet north of the road, blazed and marked "U.S.G.S. B.M. 1062"	1,061.743
Salt Springs Reservoir, south side of, in large rock about 600 feet south and in line with dam at the; copper bolt marked "1092"	1,091.018
Sec. 24, T. 2 N., R. 11 E., 250 feet north of northwest corner of; nail in notch in root of 18-inch white-oak tree, blazed and marked "U.S.G.S. B.M. 1196;" shaft of Kuhn's mine, bearing approximately S. 50° E. 1,500 feet	1,094.965
Copperopolis, 4 miles northwest of, in sec. 18, T. 2 N., R. 12 E.; 500 feet north of J. D. McCarthy's house, in slate rocks north of bunch of oak trees; nail in root of 30-inch oak tree, blazed and marked "U.S.G.S. B.M. 1126"	1,125.707
Royal Mine, about 2 miles southeast of, at the bend of the road; ½ of a mile north of Summit, between Salt Springs Valley and Copperopolis; nail in notch in root of 24-inch pine, blazed and marked "U.S.G.S. B.M. 1108"	1,106.869
Copperopolis, about 2½ miles north of, east side of road, at a summit between Salt Spring Valley and Copperopolis, at an oblique corner of the fence; iron post marked "1108"	1,106.879
San Andreas road, junction of the, 300 feet south of, near sign marked "San Andreas 17 miles; Angels 12 miles; Milton 13 miles;" nail in notch of 30-inch white-oak tree	1,076.795
Copperopolis, in front brick wall of Fontana's store, approximately 2 feet above the store floor and 3 feet above stone foundation, opposite Vendome Hotel; bronze tablet marked "971"	970.267
Copperopolis, about 2 miles east of, 100 feet west of first creek crossing and 300 feet east of an old frame house; nail in notch in root of 36-inch oak tree, blazed and marked "U.S.G.S. B.M. 745"	744.419
Copperopolis, about 4 miles southeast from, on the east side of road, about 800 feet northeast from O'Byrnes schoolhouse and 1,360 feet north 70 degrees east from ¼ corner of Secs. 24 and 13, T. 1 N., R. 12 E.; nail in root of 38-inch pine tree, blazed and marked "U.S.G.S. B.M. 674"	673.151

	Feet.
O'Byrnes Ferry, about 2 miles northwest from, on the west side of road on a small summit; nail in notch of root of 24-inch oak tree, blazed and marked "U.S.G.S. B.M. 587"	585.861
Lebaig's ranch, 1 mile east of O'Byrnes Ferry; nail in oak at door of house.	577.475
O'Byrnes Ferry, Stanislaus River, in the stone front wall of Pardee's store, between the south window and the southeast corner of store, 500 feet north of the bridge on the west side of Milton-Jamestown road; bronze tablet marked "432"	431.266
Stanislaus River, at O'Byrnes Ferry; surface of water, low stage	387.859
O'Byrnes Ferry, 1½ miles from, south side of road, about 100 feet west of the big draw at the bend of the road; nail in notch of root of 16-inch pine tree, blazed and marked "U.S.G.S. B.M. 712"	711.395
O'Byrnes Ferry, about 3 miles southeast from, 600 feet northeast of Hagerty's ranch house, near the top of the grade; nail in notch in root of 40-inch blazed pine tree	989.052
O'Byrnes Ferry grade, at summit of the, on north side of road, about 3 miles southeast from the ferry; nail in notch in root of 16-inch white-oak tree, blazed and marked "U.S.G.S. B.M. 1087"	1,086.626
O'Byrnes Ferry grade, at the top of, on the north side of, about 3 miles east of the ferry and 3 miles west of the Goodwin Ranch, 27 feet east of preceding bench mark; iron post marked "1090"	1,089.489
Goodwin's ranch house, about 1½ miles west of, on north side of road, 400 feet west of junction with Knights Ferry road; nail in notch in root of white-oak tree, blazed and marked "U.S.G.S. B.M. 1169"	1,168.099
Goodwin's ranch house, ½ mile west of; large rock in middle of road and 250 feet west of old culvert, 350 feet east of old walls and 550 feet west of crossing of Mount Diablo base line	1,143.604
Goodwin's ranch house, 300 feet north of, south side of road and 400 feet east of the junction of the Chinese Camp road; nail in notch in root of 34-inch black-oak tree, blazed and marked "U.S.G.S. B.M. 1178"	1,177.697
Goodwin's ranch house, about 1 mile east of, summit of pass inside of the fence; in crotch of live-oak tree, blazed and marked "U.S.G.S. B.M. 1385"	1,384.544
Goodwin's ranch house, about 1 mile east of the, on north side of road and 6 miles west of Jamestown and 100 feet east of preceding bench mark; iron post marked "1389"	1,388.553
Looney's ranch house, ¾ mile west of the junction of the Chinese Camp and Sonora roads; nail in notch in root of 24-inch white-oak tree, blazed and marked "U.S.G.S. B.M. 1308"	1,307.398
Jamestown, about 3 miles west of, center of road and ¼ mile east of junction of the Chinese Camp and Sonora roads; nail in notch in root of 30-inch white-oak tree, blazed but not marked	1,346.987
Jamestown, 1½ miles west of, in front of Lawrence Ranch House; nail in notch in root of 30-inch white-oak tree, blazed and marked "U.S.G.S. B.M. 1360"	1,359.117
Goodwin's wine cellar, on the north step of, about 6 miles west of Jamestown and 3½ miles north of Chinese Camp; copper plug marked "1176".	1,175.299
Jamestown, ½ mile west of; spike on the floor of joist east end of the north side of the bridge over Woods Creek	1,364.058
Woods Creek; surface of water at low stage	1,351.559
Jamestown, ½ mile west of; top of east pier of bridge at the crossing of Woods Creek	1,360.931
Jamestown, in front wall in the east end of the brick building with iron doors and a stone pavement on the south side of the road, one-half block west of Sisson's Hotel; bronze tablet marked "1403"	1,401.932

JAMESTOWN, VIA SONORA AND BELLEVUE, TO SUGAR PINE.

	Feet.
Sonora, 3 miles west of, 1 mile east of Jamestown, 150 feet southeast from the junction with the Shaws Flat and Columbia road, in front of Mary Dougherty's house; nail in notch in root of 32-inch white-oak tree, blazed and marked "1515"	1, 514. 238
Sonora, about 1¼ miles west of, north side of road and 150 feet west of summit; nail in notch in root of 36-inch double pine, blazed and marked "1699"	1, 698. 323
Sonora, in the south post of the east entrance in street wall of the courthouse; bronze tablet stamped "1825"	1, 823. 883
Sonora, in the outside wall 1 foot south of gate at the east edge of the court of the Victoria Hotel, facing Washington street; copper plug marked "1794"	1, 793. 156

SONORA, BELLEVUE, AND SUGARPINE ROAD.

Sonora, 1 mile east of, on a small summit 500 feet west of Wards Ferry and Soulsbyville road; nail in notch of root of 24-inch oak tree, blazed and marked "1989"	1, 988. 509
Sullivan Creek, about 1 mile east of, on the north side of the road, about 500 feet west of summit on the road to the reservoir; nail in notch of root of 40-inch white-oak tree, blazed and marked "U.S.G.S. B.M. 2076"	2, 074. 762
Soulsbyville, junction with road to, 125 feet east of; railroad spike on the top of an oak stump 32 inches in diameter and 30 feet north of road	2, 141. 792
Soulsbyville, junction with road to, about 3 miles east of Sonora, on the north side of Soulsbyville road, near the fence at the Cherokee Ranch; iron post marked "2144"	2, 142. 889
Sonora, pass to, about 1,000 feet east of summit of, on south side of road to reservoir; nail in notch of root of 24-inch black-oak tree, blazed and marked "U.S.G.S. B.M. 2454"	2, 453. 049
Bellevue, about 1 mile west of, opposite the Hyde Ranch; nail in notch of root of 40-inch black-oak tree on south side of road	2, 444. 247
Maxwell's house, 500 feet southeast from and 500 feet west of Bellevue Mine mill; nail in notch in root of 40-inch black-oak tree, blazed and marked "2615"	2, 614
Bellevue, 1 mile east of, at the summit of the pass between Bellevue and Sugarpine, and about 5 miles west of Sugarpine, on the west side of the road; nail in notch in root of 24-inch yellow-pine tree	2. 843. 402
Bellevue schoolhouse, 45 feet northwest of; nail in notch of root of black-oak tree	3, 020. 824
Columbia road, junction with, in triangle formed by; nail in notch in root of 24-inch black-oak tree, blazed and marked "U.S.G.S. B.M. 3253"	3, 252. 68
Columbia road, junction with, in triangle formed by; iron post marked "3254"	3, 252. 86
Sugarpine, 3¼ miles west of, on south side of road; nail in notch in root of 30-inch black-oak tree, blazed and marked "U.S.G.S. B.M. 3316"	3, 315. 283
Jasper's ranch house, ⅛ mile east of, and about 3 miles west of Sugarpine; nail in notch of root of pine tree, blazed and marked "U.S.G.S. B.M. 3630"	3, 629. 397
Mountain Home, 300 yards east of, and 78 feet west of the crossing of the T. C. ditch; nail in notch in root of 45-inch black-oak tree, blazed and marked "U.S.G.S. B.M. 3951"	3, 950. 492
Sugarpine post-office, about 800 feet east of, on rock 12 feet long, 6 feet wide, and 4 feet high in corral; copper bolt stamped "4468"	4, 467. 255

SUGARPINE, VIA STRAWBERRY, TO EUREKA VALLEY.

	Feet.
Sugarpine, about 1½ miles east of, at the top of grade on south side of road; nail in notch in root of black-oak tree, blazed and marked "U.S.G.S. B.M. 4841"	4, 840. 362
Sugarpine, about 2½ miles east of, 20 feet south of road and 100 feet east of forks of the road to Hale's sawmill; nail in notch in root of 40-inch black-oak tree, blazed and marked "U.S.G.S. B.M. 4915"	4, 914. 13
Sugarpine, about 2½ miles east of, in the forks of the road to Hale's sawmill; iron post stamped "4916"	4, 915. 607
Long barn, ½ mile west of, at top of the hill on south side of road, about 4 miles east of Sugarpine; nail in notch in root of 30-inch oak tree, blazed and marked "5033"	5, 032. 155
Long barn, 200 yards west of, 150 yards east of Brown's house and 75 yards west of the junction of road with the road to Bradford's mill, on the south side of toll road; nail in notch in root of 18-inch black-oak tree, blazed and marked "U.S.G.S. B.M. 4952"	4, 950. 845
Genesee Place (Saint's Rest), in rock 3½ feet long, 2½ feet wide, 1½ feet high, 10 feet east of the barn, 10 feet south of the road, 150 feet north of the creek, and on the west edge of a group of fir trees; copper plug marked "5139"	5, 137. 969
Genesee Place, 5,900 feet east of, on south side of road; nail in notch in root of 30-inch fir tree, blazed and marked "One Mile high"	5, 279. 3
Ball Mountain summit, between the north fork of the Tuolumne and the south fork of the Stanislaus, on the north side of the road, about 6 miles west of Strawberry, and at the northeast head of draw, on large bowlder; bronze tablet marked "5624"	5, 623. 071
Cold Spring, about ¾ of a mile west of, at the summit between the north fork of the Tuolumne and the south fork of the Stanislaus at bend of road; iron post marked "5697"	5, 696. 076
Stanislaus River, south fork of; water surface, low stage, at crossing of road	5, 214
Strawberry, 48.8 feet southeast from the southeast corner of Parson's store and 24.8 feet from the southwest corner of Parson's house, on the east side of road and on north side of south fork of the Stanislaus River; iron post marked "5240"	5, 238. 943
Strawberry, about 2½ miles east of; in top of granite bowlder at the summit between the south fork and the main fork of the Stanislaus River, and 50 feet east of road, trees blazed in vicinity; copper plug marked "6134"	6, 133. 402
Cow Creek, 50 feet east of crossing of; in side of large bowlder on south of the road; bronze tablet marked "5769"	5, 768. 629
Cascade Creek, about ½ mile west of, north of road between the 30 and 31 mile boards, 2 feet north of the corner of sections 23, 22, 15, and 14, T. 5 N., R. 18 E., and 6 feet from a sugar-pine tree marked "B. T. 60° E. 5 feet;" iron post marked "5943"	5, 942. 33
Cascade Creek; water surface at road crossing	6, 022
Mill Creek, about 1½ miles west of, on the south side of road, between the 32 and 33 mile boards; nail in notch in root of black-oak tree, blazed and marked "U.S.G.S. B.M. 6075"	6, 074. 2
Mill Creek, 200 feet east of crossing of, on the north side of road, trees blazed in vicinity; iron post marked "6273"	6, 271. 888
Mill Creek; water surface at road crossing	6, 261
Mill and Niagara creeks, summit between, on south side of road and 1½ miles east of Mill Creek; nail in notch in root of large fir tree, blazed and marked "6516"	6, 515. 26

	Feet.
Niagara Creek, about 150 feet north of the crossing of; in large granite bowlder—the highest one of a group—trees blazed in vicinity; copper plug marked "6530"	6,528.916
Niagara Creek; water surface at road crossing	6,503
Niagara Creek, about 2,000 feet west of, 60 feet southeast of summit; nail in notch in root of juniper tree blazed and marked "6630"	6,628.83
Niagara Creek and Stanislaus River, summit between, at the head of the grade and about 2,000 feet north of the Niagara Creek crossing; in a granite rock on the north side of the road, 4 feet above the road level and on the southwest face of the rock; bronze tablet marked "6638"	6,636.776
Patterson grade, summit of; nail in notch in root of a 42-inch yellow-pine tree	6,491.53
Brightmans flat, 2 miles west of, at the foot of the last hill on the Patterson grade and on the south side of road; nail in notch in root of yellow-pine tree bearing 42-mile board, blazed and marked "U.S.G.S. B.M. 5672"	5,671.21
Brightmans flat, about 2 miles southwest from, on south of the road; in pyramid-shaped rock 6 feet high, at the level road below Pattersons grade and about 400 feet east of preceding B.M.; bronze tablet marked "5664"	5,663.712
Eagle Creek bridge, 200 feet east of, on north side of road; nail in notch of root of yellow-pine tree, blazed and marked "U.S.G.S. B.M. 5786"	5,785.62
Eagle Creek; water surface at the crossing of the road	5,760
Stanislaus River; water surface at the crossing of the road	5,784
Stanislaus River, in granite ledge 28 feet northwest from the northwest corner of the bridge, and approximately 2 miles west of Douglas ranch and 6 feet above the road level; copper plug marked "5828"	5,827.461
Eureka Valley, 6 feet south of southwest corner of Douglas ranch; iron post marked "6076"	6,075.346

EUREKA VALLEY, VIA SONORA PASS, TO HARDY STATION.

Bakers station; peg 2¼ feet south of southwest corner of the main building	6,204
Bakers station, about ¼ of a mile southeast of; on rock bench at the foot of, and west side of grade, 180 feet east of road and 93 feet south of blazed yellow pine; bronze tablet marked "6265"	6,264.613
Rocky corner marked by a three-stone monument, 250 feet west of a; and 240 feet west of a blazed yellow-pine on the south side of road, on the eastern of a bunch of quartz crystals on the top of a bowlder 3 feet in diameter above the letter "S" in the road	7,686.17
Dead Mans Creek, ¼ of a mile west of first crossing of; nail in notch of 36-inch juniper tree, on the south side of road	7,974.3
Dead Mans Creek; water surface at first crossing	8,124
Sonora Pass, 3 miles west of; on a rock ledge on west side of road, and 1,000 feet west of second crossing of the creek; trees blazed in vicinity; copper plug marked "8398"	8,397.655
Dead Mans Creek, second crossing of; water surface	8,394
Sonora Pass, about 1½ miles west of, on the south side of road; nail in notch of root of tamarack, blazed and marked "U.S.G.S. B. M. 9205"	9,204.2
Sonora Pass, at summit of, on south side of road; iron post marked "9623"	9,622.935
Sonora Pass, first creek crossing east of summit of; 500 feet-east-of, and 3,100 feet east of summit, on south side of road; nail in notch in root of 48 inch tamarack tree, blazed and marked "9298"	9,297.56
Sonora Pass, 2 miles east of summit of; nail in notch in root of 24-inch tamarack, blazed and marked "U.S.G.S. B.M. 8985"	8,984.57

	Feet.
Sonora Pass, 3½ miles east of summit of, at mules' corral, just west of a large canyon that joins the road from the south, and south of road; iron post marked "8583"	8,582.714
Crinoline grade, foot of; on top of bowlder 9 feet high and 10 feet in diameter, on south side of road, about 10 miles west of Hardy station and 1,360 feet west of Leavitt's chimney, between the road and fence; copper bolt marked "7152"	7,150.975
Leavitts station, about 3 miles east of; top of granite bowlder 2 feet high and 3½ feet in diameter, 100 feet south of road, at the head of grade; approximately 1,000 feet east of basalt hill and in the summit of an old stone corral in a big meadow, about 7 miles west of Hardys	6,756.77
Unpainted shanty; west end of, at east end of meadow near a cow camp; ground elevation	6,730
Hardy station, about 3 miles west of; peg on the south side of road, by large fence post, 300 feet east of a small summit, and ¼ of a mile west of bridge over the West Walker River; post blazed and small monument.	6,736.
Hardy station, about 2½ miles west of; on rock ledge 1,400 feet east of bridge over the West Walker River, in a bend of the road, on south side of grade; copper plug marked "6703"	6,702.026
West Walker River; water surface at low stage, at road crossing	6,671
Little Walker River; water surface at low stage, at road crossing	6,933
Carson road; ground surface at junction with	6,939
Hardy station; at the junction of the Sonora, Mono toll road, and the Carson road, 60 feet east of Little Walker River; iron post marked "6942"	6,940.949

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